NECA 2014

로봇수술의 안전성과 유효성 분석(2)
– 부 록 –

NECA 한국보건의료연구원
National Evidence-based Healthcare Collaborating Agency

NECA – 정책수요기반연구

로봇수술의 안전성과 유효성 분석(2)
– 부 록 –

2014. 12. 31.

NECA 한국보건의료연구원
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주 의

1. 이 연구는 한국보건의료연구원 연구윤리심의위원회 승인(NECA IRB 14-019)을 받은 연구사업입니다.

2. 이 보고서는 한국보건의료연구원에서 수행한 연구사업의 결과 보고서로 한국보건의료연구원 연구기획관리위원회(또는 연구심의위원회)의 심의를 받았습니다.

3. 이 보고서 내용을 신문, 방송, 참고문헌, 세미나 등에 인용할 때에는 반드시 한국보건의료연구원에서 시행한 연구사업의 결과임을 밝혀야 하며, 연구내용 중 문의사항이 있을 경우에는 연구책임자 또는 주관부서에 문의하여 주시기 바랍니다.

연 구 진

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김홍대 강북삼성병원 대장항문외과

식도암/폐 및 기관지암

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박주용 국립암센터 구강종양클리닉

차 례

1. 결장암

1.1. 문헌 검색 전략

가. 국외 데이터 베이스 〈검색일자: 2014. 06. 25〉

1) Ovid MEDLINE(R) In-Process &Other Non-Indexed Citations and Ovid MEDLINE(R)1946 to Present

#	Searches	Ovid MEDLINE
1	Robotic.mp. or exp Robotics/	17621
2	Surgery, Computer-assisted.mp. or exp Surgery, Computer-Assisted/	9723
3	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus).mp.	21971
4	1 or 2 or 3	29737
5	exp colon Neoplasms/	67221
6	colectomy.mp. or exp colectomy/	18782
7	(colon* adj5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)).mp.	95579
8	5 or 6 or 7	115397
9	4 and 8	170
10	animal/ not human/	3860455
11	9 not 10	164

2) Ovid EMBASE 1974 to 2014 June 24

#	Searches	Ovid EMBASE
1	robotics.mp. or exp robotics/	23876
2	computer assisted surgery.mp. or exp computer assisted surgery/	6805
3	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus).mp.	34494
4	1 or 2 or 3	39722
5	exp colon tumor/	207664
6	exp colon cancer/	163332
7	exp colon carcinoma/	19455
8	exp colectomy/ or colectomy.mp.	29858

9	(colon* adj5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)).mp.	145029
10	5 or 6 or 7 or 8 or 9	259920
11	4 and 10	570
12	animal/ not human/	1190065
13	11 not 12	569

3) Cochrane Library

#	Searches	Cochrane
1	MeSH descriptor: [Robotics] explode all trees	512
2	MeSH descriptor: [Surgery, Computer-Assisted] explode all trees	529
3	(Surgery, Computer-assisted):ti,ab,kw	1268
4	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus):ti,ab,kw	1137
5	#1 or #2 or #3 or #4	2294
6	MeSH descriptor: [colon Neoplasms] explode all trees	1273
7	MeSH descriptor: [colectomy] explode all trees	682
8	((colon*) near/5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)):ti,ab,kw	2875
9	#6 or #7 or #8	3459
10	#5 and #9	18

나. 국내 데이터 베이스 〈검색일자: 2014. 06. 25〉

1) KoreaMed

#	Searches	KoreaMed
1	robot* AND colon*	8
2	telerobot* AND colon*	0
3	remote surg* AND colon*	0
4	remote operation* AND colon*	0
5	davinci AND colon*	0
6	da vinci AND colon*	1

7	Zeus AND colon*	0

2) KMBase

#	Searches	KMbase
1	colon AND (robot or telerobot or remote or vinci or davinci or zeus)	0
2	결장 AND (로봇 or 다빈치)	0
3	중복 제거 최종	0

3) RISS

#	Searches	RISS
1	colon 결과내 재검색 robot	6
2	colon 결과내 재검색 telerobot	0
3	colon 결과내 재검색 remote	6
4	colon 결과내 재검색 vinci	1
5	colon 결과내 재검색 davinci	1
6	colon 결과내 재검색 zeus	0
7	결장 AND 로봇	0
8	결장 AND 다빈치	0
9	중복 제거 최종	12

4) KISS

#	Searches	KISS
1	colon 결과내재검색 robot	12
2	colon 결과내재검색 telerobot	0
3	colon 결과내재검색 remote	1
4	colon 결과내재검색 vinci	1
5	colon 결과내재검색 davinci	0
6	colon 결과내재검색 zeus	0
7	결장 결과내재검색 로봇	0
8	결장 결과내재검색 다빈치	0
9	중복 제거 최종	12

5) KisTi

#	Searches	KisTi
1	(BI: colon cancer*) 결과내재검색 robot	3
2	(BI: colon cancer*) 결과내재검색 telerobot	0
3	(BI: colon cancer) 결과내재검색 remote	0
4	(BI: colon cancer*) 결과내재검색 vinci	1
5	(BI: colon cancer*) 결과내재검색 davinci	1(중복)
6	(BI: colon cancer*) 결과내재검색 zeus	0
7	(BI: 결장*) 결과내재검색 로봇	1(중복)
8	(BI: 결장*) 결과내재검색 다빈치	0
9	중복 제거 최종	4

1.2. 최종 선택문헌 목록

연번	1저자	연도	제목	저널
1	Shin JY	2012	Comparison of Short-term Surgical Outcomes between a Robotic Colectomy and a Laparoscopic Colectomy during Early Experience.	J Korean Soc Coloproctology. 2012;28(1):19-26.
2	Helvind NM	2013	No differences in short-term morbidity and mortality after robot-assisted laparoscopic versus laparoscopic resection for colonic cancer: a case-control study of 263 patients.	Surg Endosc. 2013;27(7):2575-80.
3	Morpurgo E	2013	Robotic-assisted intracorporeal anastomosis versus extracorporeal anastomosis in laparoscopic right hemicolectomy for cancer: a case control study.	J Laparoendosc Adv Surg Tech A. 2013;23(5):414-7.
4	Lim DR	2013	Robotic versus laparoscopic anterior resection of sigmoid colon cancer: comparative study of long-term oncologic outcomes.	Surg Endosc. 2013;27(4):1379-85.
5	Park JS	2012	Randomized clinical trial of robot-assisted versus standard laparoscopic right colectomy.	Br J Surg. 2012;99(9):1219-26.
6	Luca F	2011	Surgical and pathological outcomes after right hemicolectomy: Case-matched study comparing robotic and open surgery.	International Journal of Medical Robotics and Computer Assisted Surgery. 2011;7(3):298-303.

1.3. 문헌배제사유 및 배제문헌목록

① 결장암 대상이 아닌 문헌
② 로봇도움하 복강경 결장절제술이 대상이 아닌 문헌
③ 개복수술이나 복강경수술과 비교 분석되지 않은 연구
④ 적절한 결과변수가 보고되지 않은 경우
⑤ 동물실험 및 전임상시험 연구
⑥ 무작위비교임상시험이나 비무작위임상연구가 아닌 연구
⑦ 원저가 아닌 연구
⑧ 초록만 발표된 연구
⑨ 동료심사를 거쳐 학술지에 게재된 연구가 아닌 문헌
⑩ 한국어, 영어로 출판되지 않은 문헌
⑪ 중복 출판 문헌
⑫ 원문확보 불가 문헌

연번	배제 문헌	배제사유
1	Barillaro I, Coccetta M, Boccolini A, Di Patrizi MS, Giuliani D, Avenia N. Laparoscopic versus robotic right hemicolectomy. Techniques in Coloproctology. 2014 January;18 (1):107.	⑦
2	Bertani E, Chiappa A, Biffi R, Bianchi P, Branchi V, Andreoni B. Short-term outcomes for patients undergoing surgery for colorectal cancer employing three different treatment approaches (laparoscopic vs open vs robotic). European Journal of Surgical Oncology. 2010 November;36 (11):1129.	⑦
3	Bertani E, Chiappa A, Biffi R, Bianchi P, Branchi V, Papis D, et al. A comparison between open, laparoscopic, and robot-assisted surgery in the treatment of colon cancer: Prospective, monocentric short-term outcomes evaluation over 30 months. European Surgery - Acta Chirurgica Austriaca. 2011 April;43:22.	⑦
4	Boutros M, Vernava AM. A case-matched comparison of laparoscopic and robotic colorectal surgery. Surgical Endoscopy and Other Interventional Techniques. 2011 March;25:S240.	⑦
5	Casillas MA, Jr., Leichtle SW, Wahl WL, Lampman RM, Welch KB, Wellock T, et al. Improved perioperative and short-term outcomes of robotic versus conventional laparoscopic colorectal operations. Am J Surg. 2014 Jul;208(1):33-40.	⑦
6	Cho MS, Min BS. Robotic versus laparoscopic single port anterior resection for sigmoid colon cancer. Surgical Endoscopy and Other Interventional Techniques. 2014 April;28:323.	⑦
7	Colantonio LD. No differences in short-term morbidity and mortality after robot-assisted laparoscopic versus laparoscopic resection for colonic cancer: a case-control study of 263 patients. Surg Endosc. 2013 Oct;27(10):3938-9.	⑤
8	D'Annibale A, Morpurgo E, Fiscon V, Trevisan P, Sovernigo G, Orsini C, et al. Robotic and laparoscopic surgery for treatment of colorectal diseases. Dis Colon Rectum. 2004 Dec;47(12):2162-8. PubMed PMID: 15657669. English.	①
9	Davis BR, Yoo AC, Moore M, Haas S, Gunnarsson C. Comparing robot-assisted to	⑦

연번	배제 문헌	배제 사유
	conventional laparoscopic colectomy: Impact on cost and clinical outcomes. Value in Health. 2012 June;15 (4):A75.	
10	Delaney CP, Lynch AC, Senagore AJ, Fazio VW. Comparison of robotically performed and traditional laparoscopic colorectal surgery. Dis Colon Rectum. 2003 Dec;46(12):1633-9.	①
11	Deutsch GB, Gunabushanam V, Mishra N, Rubach E, Zemon H, Klein JDS, et al. Robotic vs. laparoscopic colorectal surgery: An institutional experience. Surgical Endoscopy and Other Interventional Techniques. 2011 March;25:S365.	⑦
12	Deutsch GB, Sathyanarayana SA, Gunabushanam V, Mishra N, Rubach E, Zemon H, et al. Robotic vs. laparoscopic colorectal surgery: An institutional experience. Surgical Endoscopy and Other Interventional Techniques. 2012 April;26(4):956-63. PubMed	⑤
13	Fujii S, Watanabe K, Ota M, Yamagishi S, Kunisaki C, Osada S, et al. Solo surgery in laparoscopic colectomy: a case-matched study comparing robotic and human scopist. Hepatogastroenterology. 2011 Mar-Apr;58(106):406-10.	②
14	Haas EM, Pedraza R. Laparoscopic and Robotic Colorectal Surgery: A Comparison and Contrast. Seminars in Colon and Rectal Surgery. 2013 March;24(1):19-23.	⑤
15	Helvind NM, Eriksen JR, Mogensen A, Tas B, Olsen J, Bundgaard M, et al. Reply to: re: no differences in short-term morbidity and mortality after robot-assisted laparoscopic versus laparoscopic resection for colonic cancer: a case-control study of 263 patients (Surg Endosc 2013). Surg Endosc. 2013 Oct;27(10):3940. PubMed PMID: 23719973. English.	⑤
16	Helvind NM, Eriksen JR, Mogensen A, Tas B, Olsen J, Jakobsen HL, et al. No differences in short term morbidity and mortality in patients operated with robotassisted laparoscopic colectomy for colonic cancer compared with laparoscopic colectomy: A case-control study of 263 patients. Surgical Endoscopy and Other Interventional Techniques. 2013 April;27:S493.	⑦
17	Hrabe J, Cyr AR, Cromwell JW, Byrn J. Robotic assisted single incision ileocolic resection using standard robotic instrumentation and a single incision laparoscopy surgery (SILS) port. Gastroenterology. 2013 May;1):S1056.	⑦
18	Jayne DG, Guillou PJ, Thorpe H, Quirke P, Copeland J, Smith AMH, et al. Randomized trial of laparoscopic-assisted resection of colorectal carcinoma: 3-Year results of the UK MRC CLASICC trial group. Journal of Clinical Oncology. 2007 20 Jul;25(21):3061-8.	②
19	Jimenez Rodriguez RM, Diaz Pavon JM, de La Portilla de Juan F, Prendes Sillero E, Hisnard Cadet Dussort JM, Padillo J. Prospective randomised study: Robotic-assisted versus conventional laparoscopic surgery in colorectal cancer resection. [Spanish] Estudio prospectivo, aleatorizado: cirugia laparosco pica con asistencia robo tica versus cirugia laparosco pica convencional en la reseccion del cancer colorrectal. Cirugia Espanola. 2011 August-September;89(7):432-8.	⑧
20	Juo YY, Hyder O, Haider AH, Camp M, Lidor A, Ahuja N. Cost and outcomes	⑦

연번	배제 문헌	배제 사유
	analysis of robotic, laparoscopic, and open colon resection: A national study. J Am Coll Surg. 2013 September;1):S112-S3.	
21	Juo YY, Hyder O, Haider AH, Camp M, Lidor A, Ahuja N. Is minimally invasive colon resection better than traditional approaches?: First comprehensive national examination with propensity score matching. JAMA Surg. 2014 Feb;149(2):177-84.	①
22	Kang CY, Pigazzi A. Hybrid laparoscopic total colectomy/robotic extralevator abdominoperineal resection. Gastroenterology. 2012 May;1):S1031. PubMed PMID: 71109222. English.	⑦
23	Lavery HJ, Patel SA, Chin E, Samadi DB. Combined robotic-assisted laparoscopic prostatectomy and laparoscopic hemicolectomy. J Soc Laparoendosc Surg. 2011 Oct-Dec;15(4):550-4. PubMed PMID: 22643515.	①
24	Luca F, Valvo M, Cenciarelli S, Ghezzi TL, Zuccaro M, Pozzi S, et al. A comparative study on robotic versus open right hemicolectomy for cancer. International Journal of Medical Robotics and Computer Assisted Surgery. 2011 November;7:37.	⑦
25	Merola S, Weber P, Wasielewski A, Ballantyne GH. Comparison of laparoscopic colectomy with and without the aid of a robotic camera holder. Surg Laparosc Endosc Percutan Tech. 2002 Feb;12(1):46-51.	②
26	Miller AT, Berian JR, Rubin M, Hurst RD, Fichera A, Umanskiy K. Robotic-assisted proctectomy for inflammatory bowel disease: a case-matched comparison of laparoscopic and robotic technique. J Gastrointest Surg. 2012 Mar;16(3):587-94.	①
27	Moncrief S, Kassir A, Shirah G. A comparison of robotic and laparoscopic colon resection for diverticular disease. Should we move on? Diseases of the Colon and Rectum. 2013 April;56 (4):e120.	⑦
28	Montenegro G, Makhoul R, Obias V. Robotic versus laparoscopic colon and rectal surgery: Early comparisons. International Journal of Medical Robotics and Computer Assisted Surgery. 2011 November;7:38.	⑦
29	Morelli L, Guadagni S, Caprili G, Di Candio G, Boggi U, Mosca F. Robotic right colectomy using the Da Vinci Single-Site platform: case report. Int J Med Robot. 2013 Sep;9(3):258-61.	③
30	Morpurgo E, Contardo T, Zerbinati A, Orsini C, Molaro R. Hybrid robotic right hemicolectomy for cancer of the ascending colon: A case control study. Surgical Endoscopy and Other Interventional Techniques. 2012 March;26:S409.	⑦
31	Noel JK, Fahrbach K, Estok R, Cella C, Frame D, Linz H, et al. Minimally Invasive Colorectal Resection Outcomes: Short-term Comparison with Open Procedures. J Am Coll Surg. 2007 February;204(2):291-307.	⑤
32	Olsen J, Jacobsen HL, Bundgaard M, Brisling S. Robotic-assisted laparoscopic surgery for colon and rectum. Colorectal Dis. 2010 September;12:45.	⑦
33	Ostrowitz MB, Rubach E, Choy C, DeNoto G. Robotic assisted compared to standard laparoscopic single incision right colectomy: Early experience with different approaches. International Journal of Medical Robotics and Computer Assisted Surgery. 2011 November;7:12-3.	⑦

연번	배제 문헌	배제 사유
34	Pappis HC, Pararas N, Kotsakou D. Comparison of robotically performed and traditional laparoscopic colorectal surgery. International Journal of Medical Robotics and Computer Assisted Surgery. 2011 November;7:38.	⑦
35	Paraiso MFR, Jelovsek JE, Frick A, Chen CCG, Barber MD. Conventional laparoscopic versus robotic-assisted laparoscopic sacral colpopexy: A randomized controlled trial. Neurourology and Urodynamics. 2010 August;29 (6):964-5.	⑦
36	Park JS, Choi GS, Lim KH, Jang YS, Jun SH. S052: a comparison of robot-assisted, laparoscopic, and open surgery in the treatment of rectal cancer. Surg Endosc. 2011 Jan;25(1):240-8.	①
37	Patel CB, Ragupathi M, Ramos-Valadez DI, Haas EM. A three-arm (laparoscopic, hand-assisted, and robotic) matched-case analysis of intraoperative and postoperative outcomes in minimally invasive colorectal surgery. Diseases of the Colon and Rectum. 2011 February;54(2):144-50.	⑦
38	Petz WL, Montorsi M, Opocher E, Casali L, Bona S, Pisani Ceretti A, et al. Minimally invasive right colectomy for cancer: Intra versus extracorporeal anastomosis. A multi-institutional experience. Surgical Endoscopy and Other Interventional Techniques. 2013 April;27:S77. PubMed PMID: 71046185. English.	⑦
39	Polavaropu H, Nassif GJ, Monroy A, Teresa De BA, Atallah S, Albert MR, et al. Short term outcomes comparing laparoscopic versus robotic colectomies. Surgical Endoscopy and Other Interventional Techniques. 2013 April;27:S320.	⑦
40	Proske JM, Dagher I, Franco D. Comparative study of human and robotic camera control in laparoscopic biliary and colon surgery. J Laparoendosc Adv Surg Tech A. 2004 Dec;14(6):345-8.	②
41	Rawlings AL, Woodland JH, Vegunta RK, Crawford DL. Robotic versus laparoscopic colectomy. Surg Endosc. 2007 Oct;21(10):1701-8.	①
42	Reddy SS, Sigurdson ER, Farma JM. Treatment of colorectal cancers with minimally invasive surgical techniques at a dedicated cancer center. Journal of Clinical Oncology. 2013 01 Feb;1).	⑦
43	Shin JW, Kim SH. Robotic versus laparoscopic surgery in colon and rectal cancer. [Korean]. Journal of the Korean Medical Association. 2012 July;55(7):620-8.	⑤
44	Shin JW, Kim SH. Robotic versus laparoscopic surgery in colon and rectal cancer. [Korean]. Journal of the Korean Medical Association. 2012 July;55(7):620-8.	⑤
45	Stanciulea O, Eftimie M, David L, Tomulescu V, Vasilescu C, Popescu I. Robotic surgery for rectal cancer: a single center experience of 100 consecutive cases. Chirurgia (Bucur). 2013 Mar-Apr;108(2):143-51.	①

1.4. 개별합병증 Forest plot

가. 로봇수술 VS 복강경수술

1) 장폐색

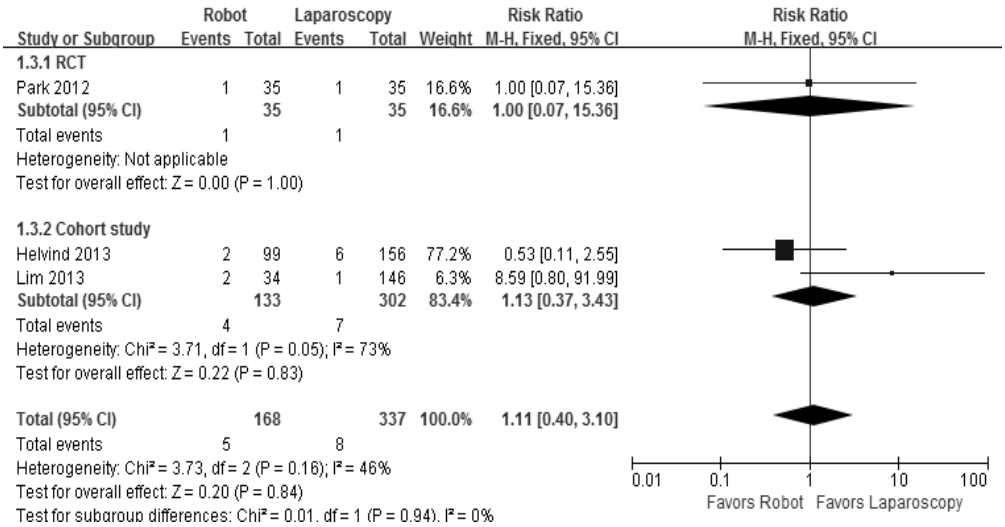


그림 1. [결장암] 장폐색: 로봇수술 vs 복강경수술

2) 문합누출

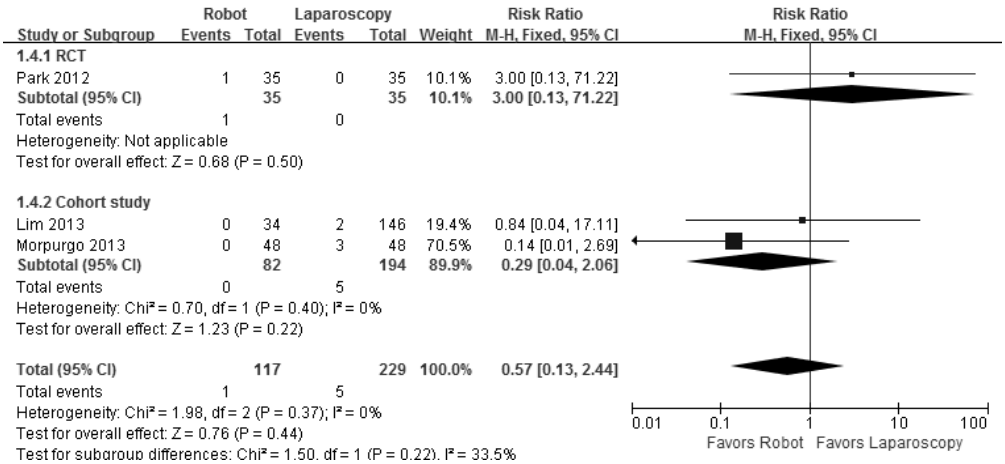


그림 2. [결장암] 문합누출: 로봇수술 vs 복강경수술

3) 상처파열

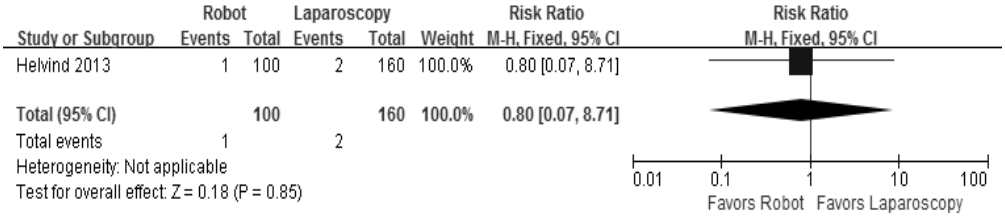


그림 3. [결장암] 상처파열: 로봇수술 vs 복강경수술

4) 출혈여부

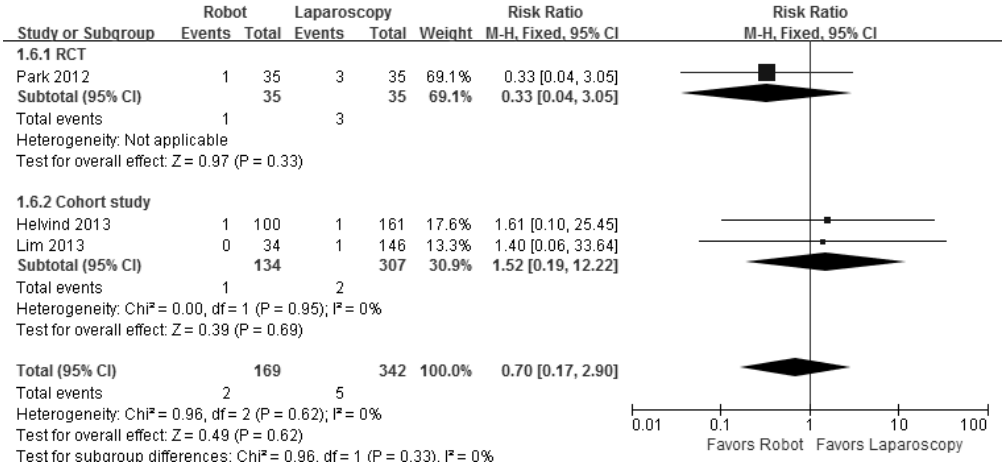


그림 4. [결장암] 출혈여부: 로봇수술 vs 복강경수술

5) 폐렴

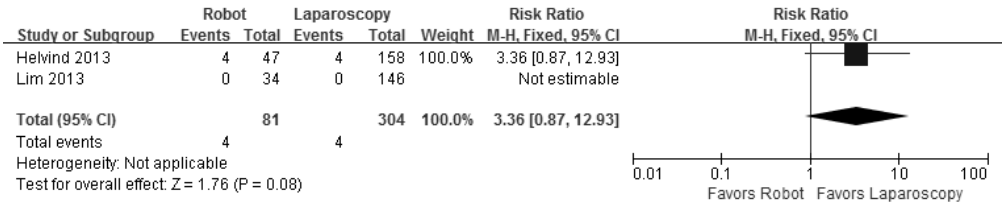


그림 5. [결장암] 폐렴: 로봇수술 vs 복강경수술

6) 유미복막증

그림 6. [결장암] 유미복막증: 로봇수술 vs 복강경수술

7) 복부농양

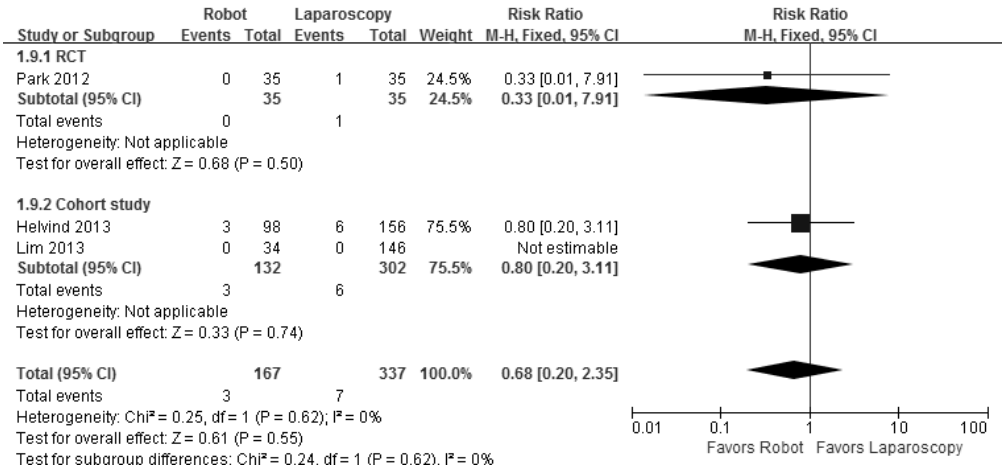


그림 7. [결장암] 복부농양: 로봇수술 vs 복강경수술

8) 심근경색

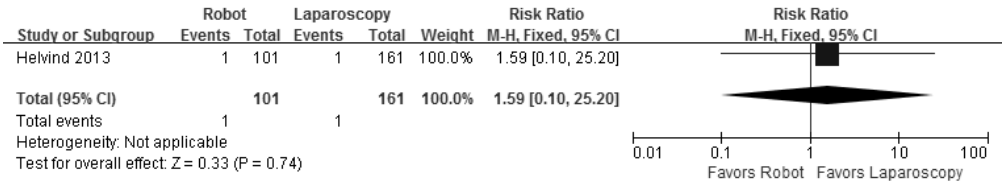


그림 8. [결장암] 심근경색: 로봇수술 vs 복강경수술

9) 뇌졸중

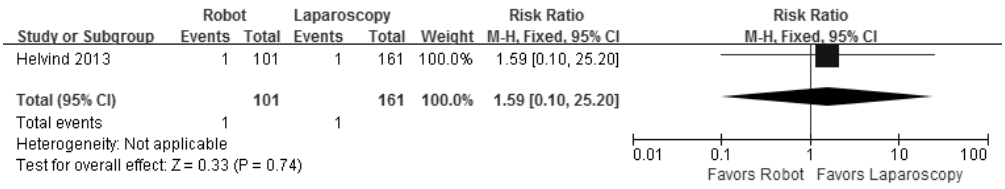


그림 9. [결장암] 뇌졸중: 로봇수술 vs 복강경수술

10) 상처감염

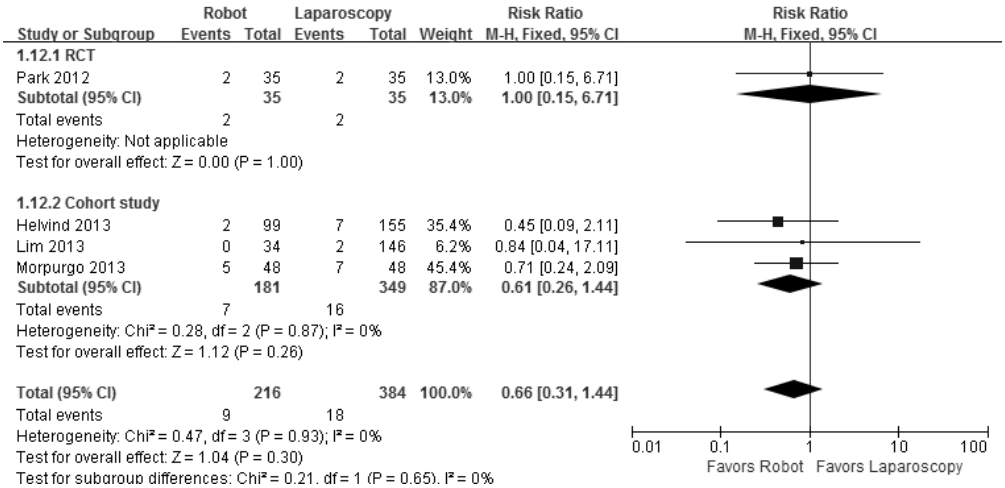


그림 10. [결장암] 상처감염: 로봇수술 vs 복강경수술

11) 요로감염

그림 11. [결장암] 요로감염: 로봇수술 vs 복강경수술

2. 식도암

2.1. 문헌 검색 전략

가. 국외 데이터 베이스 〈검색일자: 2014. 07. 04〉

1) Ovid MEDLINE(R) In-Process &Other Non-Indexed Citations and Ovid MEDLINE(R)1946 to Present

#	Searches	Ovid MEDLINE
1	Robotic.mp. or exp Robotics/	17784
2	Surgery, Computer-Assisted.mp. or exp Surgery, Computer-Assisted/	9809
3	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus).mp.	22189
4	1 or 2 or 3	30035
5	exp Esophageal Neoplasms/	38602
6	esophagectomy.mp. or exp esophagectomy/	8593
7	(esopha* adj5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)).mp.	45098
8	5 or 6 or 7	47057
9	4 and 8	99
10	animal/ not human/	3873264
11	9 not 10	96

2) Ovid EMBASE 1974 to 2014 July 02

#	Searches	Ovid EMBASE
1	robotics.mp. or exp robotics/	23962
2	computer assisted surgery.mp. or exp computer assisted surgery/	6820
3	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus).mp.	34607
4	1 or 2 or 3	39847
5	exp esophagus tumor/	56478
6	exp esophagus cancer/	41351
7	exp esophagus carcinoma/	13511
8	exp esophagectomy/ or esophagectomy.mp.	13889
9	(esopha* adj5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or	65822

	tumo?r* or malignan*)).mp.	
10	5 or 6 or 7 or 8 or 9	71053
11	4 and 10	249
12	animal/ not human/	1190761
13	11 not 12	248

3) Cochrane Library

#	Searches	Cochrane
1	MeSH descriptor: [Robotics] explode all trees	513
2	MeSH descriptor: [Surgery, Computer-Assisted] explode all trees	530
3	(Surgery, Computer-assisted):ti,ab,kw	1284
4	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus):ti,ab,kw	1155
5	#1 or #2 or #3 or #4	2328
6	MeSH descriptor: [Esophageal Neoplasms] explode all trees	987
7	MeSH descriptor: [esophagectomy] explode all trees	292
8	((esoph*) near/5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)):ti,ab,kw	1835
9	#6 or #7 or #8	1822
10	#5 and #9	14

나. 국내 데이터 베이스 〈검색일자: 2014. 07. 04〉

1) KoreaMed

#	Searches	KoreaMed
1	robot* AND esopha*	6
2	telerobot* AND esopha*	0
3	remote surg* AND esopha*	0
4	remote operation* AND esopha*	0
5	davinci AND esopha*	0

6	da vinci AND esopha*	2
7	Zeus AND esopha*	0

2) KMBase

#	Searches	KMbase
1	esopha* AND (robot or telerobot or remote or vinci or davinci or zeus)	0
2	식도 AND (로봇 or 다빈치)	0
3	중복 제거 최종	0

3) RISS

#	Searches	RISS
1	esopha* 결과내 재검색 robot	0
2	esopha* 결과내 재검색 telerobot	0
3	esopha* 결과내 재검색 remote	0
4	esopha* 결과내 재검색 vinci	0
5	esopha* 결과내 재검색 davinci	0
6	esopha* 결과내 재검색 zeus	0
7	식도 AND 로봇	2
8	식도 AND 다빈치	1
9	중복 제거 최종	2

4) KISS

#	Searches	KISS
1	esopha* 결과내재검색 robot	1
2	esopha* 결과내재검색 telerobot	0
3	esopha* 결과내재검색 remote	0
4	esopha* 결과내재검색 vinci	0
5	esopha* 결과내재검색 davinci	0
6	esopha* 결과내재검색 zeus	0
7	식도 결과내재검색 로봇	8
8	식도 결과내재검색 다빈치	2
9	중복 제거 최종	9

5) KisTi

#	Searches	KisTi
1	(BI: esopha* cancer) 결과내재검색 robot	3
2	(BI: esopha* cancer) 결과내재검색 telerobot	0
3	(BI: esopha* cancer) 결과내재검색 remote	3
4	(BI: esopha* cancer) 결과내재검색 vinci	2
5	(BI: esopha* cancer) 결과내재검색 davinci	1
6	(BI: esopha* cancer) 결과내재검색 zeus	0
7	(BI: 식도*) 결과내재검색 로봇	10
8	(BI: 식도*) 결과내재검색 다빈치	3
9	중복 제거 최종	9

2.2. 최종 선택문헌 목록

번호	1저자	연도	제목	저널
1	Kim DJ	2014	Feasibility of a robot-assisted thoracoscopic lymphadenectomy along the recurrent laryngeal nerves in radical esophagectomy for esophageal squamous carcinoma.	Surg Endosc. 2014;28(6):1866-73.
2	Sarkaria IS	2013	Combined thoracoscopic and laparoscopic robotic-assisted minimally invasive esophagectomy using a four-arm platform: experience, technique and cautions during early procedure development.	Eur J Cardiothorac Surg. 2013;43(5):e107-15.
3	de la Fuente SG	2013	Initial experience from a large referral center with robotic-assisted Ivor Lewis esophagogastrectomy for oncologic purposes.	Surg Endosc. 2013;27(9):3339-47.
4	Cerfolio RJ	2013	Technical aspects and early results of robotic esophagectomy with chest anastomosis.	J Thorac Cardiovasc Surg. 2013;145(1):90-6.
5	Weksler B	2012	Robot-assisted minimally invasive esophagectomy is equivalent to thoracoscopic minimally invasive esophagectomy.	Dis Esophagus. 2012;25(5):403-9.

6	Suda K	2012	Robot-assisted thoracoscopic lymphadenectomy along the left recurrent laryngeal nerve for esophageal squamous cell carcinoma in the prone position: technical report and short-term outcomes.	World J Surg. 2012;36(7):1608-16.
7	Kim DJ	2010	Thoracoscopic esophagectomy for esophageal cancer: feasibility and safety of robotic assistance in the prone position.	J Thorac Cardiovasc Surg. 2010;139(1):53-9.e1.
8	Boone J	2009	Robot-assisted thoracoscopic oesophagectomy for cancer.	Br J Surg. 2009;96(8):878-86.
9	Kernstine KH	2007	The first series of completely robotic esophagectomies with three-field lymphadenectomy: initial experience.	Surg Endosc. 2007;21(12):2285-92.
10	Bodner JC	2005	Robotic-assisted thoracoscopic surgery (RATS) for benign and malignant esophageal tumors.	Ann Thorac Surg. 2005;80(4):1202-6.

2.3. 배제사유 및 배제문헌 목록

① 식도암 대상이 아닌 문헌
② 로봇을 이용한 식도절제술 대상이 아닌 문헌
③ 개흉수술이나 흉강경수술과 비교 분석되지 않은 연구
④ 적절한 결과변수가 보고되지 않은 경우
⑤ 동물실험 및 전임상시험 연구
⑥ 무작위비교임상시험이나 비무작위임상연구가 아닌 연구
⑦ 원저가 아닌 연구
⑧ 초록만 발표된 연구
⑨ 동료심사를 거쳐 학술지에 게재된 연구가 아닌 문헌
⑩ 한국어, 영어로 출판되지 않은 문헌
⑪ 중복 출판 문헌
⑫ 원문 확보 불가 문헌

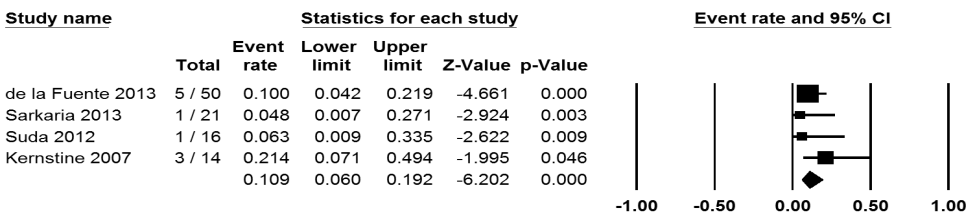
연번	배제 문헌	배제사유
1	Anderson C, Hellan M, Kernstine K, Ellenhorn J, Lai L, Trisal V, et al. Robotic surgery for gastrointestinal malignancies. International Journal of Medical Robotics and Computer Assisted Surgery. 2007 December;3(4):297-300.	②
2	Coker AM, Barajas-Gamboa JS, Cheverie J, Jacobsen GR, Sandler BJ, Talamini MA, et al. Outcomes of robotic-assisted transhiatal esophagectomy for esophageal cancer after neoadjuvant chemoradiation. J Laparoendosc Adv Surg Tech A. 2014	②

연번	배제 문헌	배제 사유
	Feb;24(2):89-94.	
3	Dunn DH, Johnson EM, Morphew JA, Dilworth HP, Krueger JL, Banerji N. Robot-assisted transhiatal esophagectomy: a 3-year single-center experience. Dis Esophagus. 2013 Feb-Mar;26(2):159-66.	②
4	Galvani CA, Gorodner MV, Moser F, Jacobsen G, Chretien C, Espat NJ, et al. Robotically assisted laparoscopic transhiatal esophagectomy. Surg Endosc. 2008 Jan;22(1):188-95.	②
5	Puntambekar SP, Rayate N, Joshi S, Agarwal G. Robotic transthoracic esophagectomy in the prone position: experience with 32 patients with esophageal cancer. J Thorac Cardiovasc Surg. 2011 Nov;142(5):1283-4.	⑤
6	Sutherland J, Banerji N, Morphew J, Johnson E, Dunn D. Postoperative incidence of incarcerated hiatal hernia and its prevention after robotic transhiatal esophagectomy. Surg Endosc. 2011 May;25(5):1526-30.	②
7	van Hillegersberg R, Boone J, Draaisma WA, Broeders IA, Giezeman MJ, Borel Rinkes IH. First experience with robot-assisted thoracoscopic esophagolymphadenectomy for esophageal cancer. Surg Endosc. 2006 Sep;20(9):1435-9.	②

2.4. 개별합병증 Forest plot

1) 폐렴

1저자	출판 연도	연구 설계	대상환자	N	발생빈도
de la Fuente	2013	case series (retro)	Esophageal cancer	50	10.0% (5/50)
Sarkaria	2013	case series (pro)	Esophageal cancer	21	4.8% (1/21)
Suda	2012	case series (pro)	Esophageal cancer	16	6.2% (1/16)
Kernstine	2007	case series (retro)	Esophageal cancer	14	21.4% (3/14)

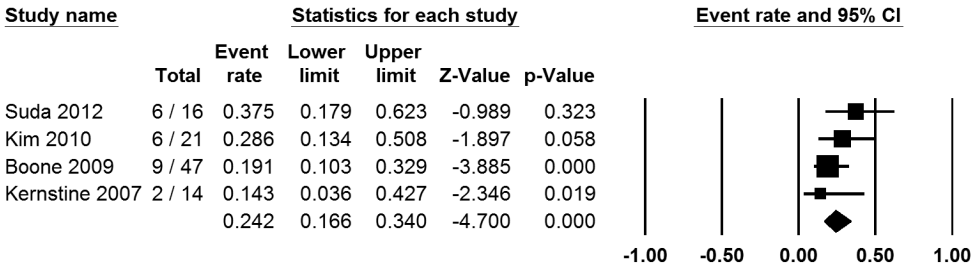


Model	Effect size and 95% interval			Heterogeneity		
	Event rate	Lower limit	Upper limit	Q-value	df(Q)	I^2
Fixed	0.109	0.060	0.192	2.664	3	0

그림 12. [식도암] 폐렴: 환자군 연구

2) 성대마비

1저자	출판 연도	연구 설계	대상환자	N	발생빈도
Suda	2012	case series (pro)	Esophageal cancer	16	37.5% (6/16)
Kim	2010	case series (pro)	Esophageal cancer	21	28.6% (6/21)
Boone	2009	case series (pro)	Esophageal cancer	47	19.1% (9/47)
Kernstine	2007	case series (retro)	Esophageal cancer	14	14.3% (1/14)

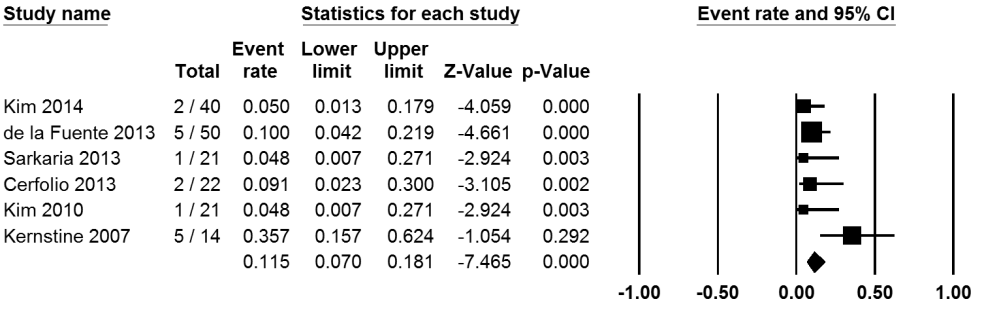


Model	Effect size and 95% interval			Heterogeneity		
	Event rate	Lower limit	Upper limit	Q-value	df(Q)	I^2
Fixed	0.242	0.166	0.340	3.084	3	2.712

그림 13. [식도암] 성대마비: 환자군 연구

3) 심방세동

1저자	출판 연도	연구 설계	대상환자	N	발생빈도
Kim	2014	case series (retro)	Esophageal cancer	40	5.0% (2/40)
de la Fuente	2013	case series (retro)	Esophageal cancer	50	5.0% (2/40)
Sarkaria	2013	case series (pro)	Esophageal cancer	21	4.8% (1/21)
Cerfolio	2013	case series (retro)	Esophageal cancer	22	9.0% (2/22)
Kim	2010	case series (pro)	Esophageal cancer	21	4.8% (1/21)
Kernstine	2007	case series (retro)	Esophageal cancer	14	35.7% (5/14)

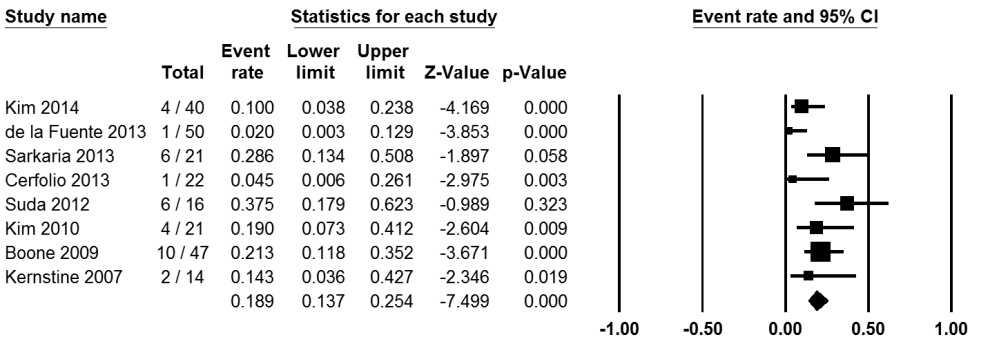


Model	Effect size and 95% interval			Heterogeneity		
	Event rate	Lower limit	Upper limit	Q-value	df(Q)	I^2
Fixed	0.115	0.070	0.181	10.309	5	51.499

그림 14. [식도암] 심방세동: 환자군 연구

4) 문합누출

1저자	출판 연도	연구 설계	대상환자	N	발생빈도
Kim	2014	case series (retro)	Esophageal cancer	40	10.0% (4/40)
de la Fuente	2013	case series (retro)	Esophageal cancer	50	2.0% (6/21)
Sarkaria	2013	case series (pro)	Esophageal cancer	21	28.6% (6/21)
Cerfolio	2013	case series (retro)	Esophageal cancer	22	4.5% (1/22)
Suda	2012	case series (retro)	Esophageal cancer	16	37.5% (6/16)
Kim	2010	case series (pro)	Esophageal cancer	21	19.0% (4/21)
Boone	2009	case series (pro)	Esophageal cancer	47	21.3% (10/47)
Kernstine	2007	case series (pro)	Esophageal cancer	14	14.3% (2/14)

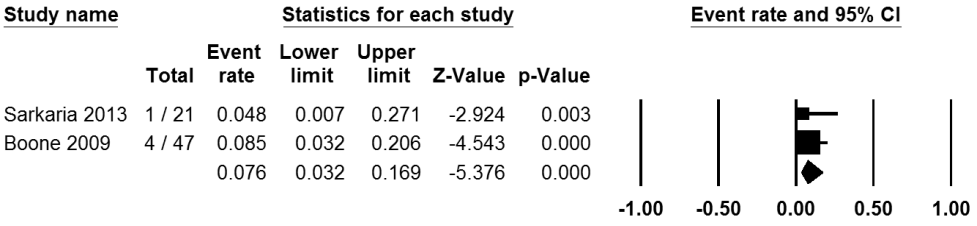


Model	Effect size and 95% interval			Heterogeneity		
	Event rate	Lower limit	Upper limit	Q-value	df(Q)	I^2
Fixed	0.189	0.137	0.254	15.164	7	53.839

그림 15. [식도암] 문합누출: 환자군 연구

5) 농흉

1저자	출판 연도	연구 설계	대상환자	N	발생빈도
Sarkaria	2013	case series (pro)	Esophageal cancer	21	4.8% (1/21)
Suda	2012	case series (pro)	Esophageal cancer	16	0% (0/16)
Boone	2009	case series (pro)	Esophageal cancer	47	8.5% (4/47)

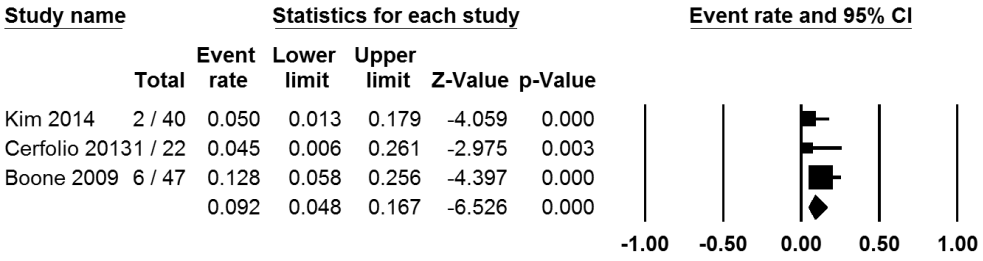


Model	Effect size and 95% interval			Heterogeneity		
	Event rate	Lower limit	Upper limit	Q-value	df(Q)	I^2
Fixed	0.076	0.032	0.169	0.291	1	0

그림 16. [식도암] 농흉: 환자군 연구

6) 유미흉

1저자	출판 연도	연구 설계	대상환자	N	발생빈도
Kim	2014	case series (retro)	Esophageal cancer	40	5.0% (2/40)
Cerfolio	2013	case series (retro)	Esophageal cancer	22	4.5% (1/22)
Suda	2012	case series (pro)	Esophageal cancer	16	0% (0/16)
Boone	2009	case series (pro)	Esophageal cancer	47	12.8% (6/47)



Model	Effect size and 95% interval			Heterogeneity		
	Event rate	Lower limit	Upper limit	Q-value	df(Q)	I^2
Fixed	0.092	0.048	0.167	2.069	2	3.2

그림 17. [식도암] 유미흉: 환자군 연구

7) 폐 색전증

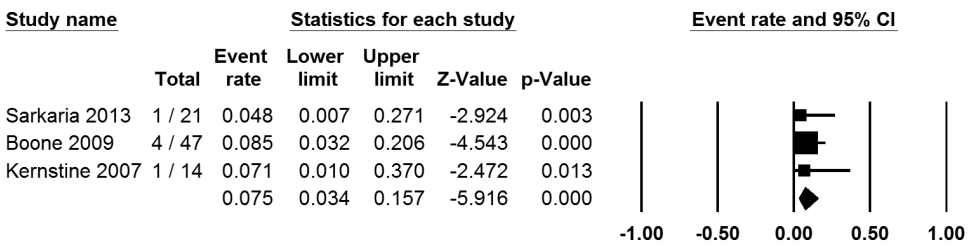
1저자	출판 연도	연구 설계	대상환자	N	발생빈도
Sarkaria	2013	case series (pro)	Esophageal cancer	21	9.5% (2/21)

8) 요로감염

1저자	출판 연도	연구 설계	대상환자	N	발생빈도
Sarkaria	2013	case series (pro)	Esophageal cancer	21	4.8% (1/21)

9) 상처감염

1저자	출판 연도	연구 설계	대상환자	N	발생빈도
Sarkaria	2013	case series (pro)	Esophageal cancer	21	4.8% (1/21)
Boone	2009	case series (pro)	Esophageal cancer	47	8.5% (4/47)
Kernstine	2007	case series (retro)	Esophageal cancer	14	7% (1/14)



Model	Effect size and 95% interval			Heterogeneity		
	Event rate	Lower limit	Upper limit	Q-value	df(Q)	I^2
Fixed	0.075	0.034	0.157	0.294	2	0

그림 18. [식도암] 상처감염: 환자군 연구

3. 방광암

3.1. 문헌 검색 전략

가. 국외 데이터 베이스 〈검색일자: 2014. 08. 05〉

1) Ovid MEDLINE(R) In-Process &Other Non-Indexed Citations and Ovid MEDLINE(R)1946 to Present

#	Searches	Ovid MEDLINE
1	Robotics.mp. or exp Robotics/	14562
2	Surgery, Computer-assisted.mp. or exp Surgery, Computer-Assisted/	9552
3	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus).mp.	21618
4	1 or 2 or 3	29235
5	exp Urinary Bladder Neoplasms/	43314
6	cystectomy.mp. or exp Cystectomy/	11185
7	(bladder* adj5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)).mp.	53125
8	5 or 6 or 7	56354
9	4 and 8	469

2) Ovid EMBASE 1974 to 2014 August 04

#	Searches	Ovid EMBASE
1	robotics.mp. or exp robotics/	23336
2	computer assisted surgery.mp. or exp computer assisted surgery/	6745
3	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus).mp.	33529
4	1 or 2 or 3	38708
5	exp bladder tumor/	62074
6	exp bladder cancer/	44209
7	exp bladder carcinoma/	14059
8	exp cystectomy/ or cystectomy.mp.	19506
9	(bladder* adj5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)).mp.	74881

10	5 or 6 or 7 or 8 or 9	82169
11	4 and 10	1319

3) Cochrane Library

#	Searches	Cochrane
1	MeSH descriptor: [Robotics] explode all trees	512
2	MeSH descriptor: [Surgery, Computer-Assisted] explode all trees	529
3	(Surgery, Computer-assisted):ti,ab,kw	1258
4	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus):ti,ab,kw	1131
5	#1 or #2 or #3 or #4	2278
6	MeSH descriptor: [Urinary Bladder Neoplasms] explode all trees	1057
7	MeSH descriptor: [Cystectomy] explode all trees	177
8	((bladder*) near/5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)):ti,ab,kw	1652
9	#6 or #7 or #8	1688
10	#5 and #9	13

나. 국내 데이터 베이스 〈검색일자: 2014. 08. 10〉

1) KoreaMed

#	Searches	KoreaMed
1	robot* [ALL] AND bladder* [ALL]	26
2	telerobot* [ALL] AND bladder* [ALL]	0
3	remote surg* [ALL] AND bladder* [ALL]	0
4	remote operat* [ALL] AND bladder* [ALL]	0
5	davinci [ALL] AND bladder* [ALL]	0
6	da vinci [ALL] AND bladder* [ALL]	3
7	zeus [ALL] AND bladder* [ALL]	0
		합계 29

2) KMBase

#	Searches	KMbase
1	(robot OR telerobot OR remote surgery OR remote operation OR davinci OR da vinci OR zeus) AND bladder	25
2	(방광OR 방광암) AND (로봇 OR 다빈치 OR 제우스)	4
		합계 29

3) RISS

#	Searches	RISS
1	(robot OR telerobot OR remote surgery) AND bladder	5
2	(remote operation OR davinci OR da vinci) AND bladder	1
3	zeus OR bladder	0
4	(로봇 OR 다빈치 OR 제우스) AND 방광	2
5	(로봇 OR 다빈치 OR 제우스) AND 방광암	0
		합계 8

4) KISS

#	Searches	KISS
1	(robot OR telerobot OR remote surgery OR remote operation OR davinci) AND bladder	1
2	(da vinci OR zeus) AND bladder	0
3	(로봇 OR 다빈치 OR 제우스) AND 방광	0
4	(로봇 OR 다빈치 OR 제우스) AND 방광	0
		합계 1

5) KisTi

#	Searches	KisTi
1	(BI: BLADDER*) AND (BI: ROBOT* OR TELEROBOT* OR REMOTE SURG* OR REMOTE OPERAT* OR DA VINCI OR DAVINCI OR ZEUS)	0

2	(BI:방광 OR 방광암) AND (BI:로봇 OR 다빈치 OR 제우스)	0
		합계 0

3.2. 최종 선택문헌 목록

번호	1저자	연도	제목	저널
1	Bernard H. Bochner	2014	A Randomized Trial of Robot-Assisted Laparoscopic Radical Cystectomy	NEJM
2	D. J. Parekh	2013	Perioperative outcomes and oncologic efficacy from a pilot prospective randomized clinical trial of open versus robotic assisted radical cystectomy	Journal of Urology
3	J. Nix	2010	Prospective randomized controlled trial of robotic versus open radical cystectomy for bladder cancer: perioperative and pathologic results	EUROPEAN UROLOGY 57 (2010) 196-.201
4	A. A. Aboumohamed	2014	Health-related quality of life outcomes after robot-assisted and open radical cystectomy using a validated bladder-specific instrument: a multi-institutional study	UROLOGY 83 (6), 2014
5	M. Musch	2014	Comparison of early postoperative morbidity after robot-assisted and open radical cystectomy: results of a prospective observational study	BJU Int 2014; 113: 458-.467
6	D. C. Snow-Lisy	2014	Robotic and laparoscopic radical cystectomy for bladder cancer: long-term oncologic outcomes	EUROPEAN UROLOGY 65 (2014) 193-.200
7	구교철	2014	Analgesic Opioid Dose Is an Important Indicator of Postoperative Ileus Following Radical Cystectomy with Ileal Conduit: Experience in the Robotic Surgery Era	Yonsei Med J 55(5):1359-1365, 2014
8	C. B. Anderson	2013	Ureteroenteric anastomotic strictures after radical cystectomy-does operative approach matter?	Journal of Urology
9	A. K. Kader	2013	Robot-assisted laparoscopic vs open radical cystectomy: comparison of complications and perioperative oncological outcomes in 200 patients	BJU International

10	M. L. Knox	2013	Robotic versus open radical cystectomy: identification of patients who benefit from the robotic approach	JOURNAL OF ENDOUROLOGY Volume 27, Number 1, January 2013
11	K. G. Nepple	2013	Early oncologic outcomes of robotic vs. open radical cystectomy for urothelial cancer	Urologic Oncology: Seminars and Original Investigations 31 (2013) 894–898
12	R . Abaza	2012	Quality of lymphadenectomy is equivalent with robotic and open cystectomy using an extended template	Journal of Urology
13	T . Gondo	2012	Robotic versus open radical cystectomy: prospective comparison of perioperative and pathologic outcomes in Japan	Jpn J Clin Oncol 2012;42(7)625–.631
14	M. S. Khan	2012	A dual-centre, cohort comparison of open, laparoscopic and robotic-assisted radical cystectomy	Int J Clin Pract, July 2012, 66, 7, 656–662.
15	N. R. Styn	2012	Matched comparison of robotic-assisted and open radical cystectomy	UROLOGY 79 (6), 2012
16	H. H. Sung	2012	A comparison of early complications between open and robot-assisted radical cystectomy	JOURNAL OF ENDOUROLOGY Volume 26, Number 6, June 2012
17	C. K. Ng	2010	A comparison of postoperative complications in open versus robotic cystectomy	EUROPEAN UROLOGY 57 (2010) 274–. 282
18	J. B. Abraham	2007	Comparative analysis of laparoscopic and robot-assisted radical cystectomy with ileal conduit urinary diversion	JOURNAL OF ENDOUROLOGY Volume 21, Number 12, December 2007
19	K. A. Guru	2007	Robot-assisted radical cystectomy versus open radical cystectomy: assessment of postoperative pain	The Canadian Journal of Urology
20	A . Galich	2006	Comparative analysis of early perioperative outcomes following radical cystectomy by either the robotic or open method	JSLS (2006)10:145–-150
21	J. J. Rhee	2006	Radical cystectomy with ileal conduit diversion: early prospective evaluation of the impact of robotic assistance	BJUINTERNATIONAL

3.3. 문헌배제사유 및 배제문헌목록

① 방광암 대상이 아닌 문헌
② 로봇도움하 복강경 방광절제술이 대상이 아닌 문헌
③ 개복수술이나 복강경수술과 비교 분석되지 않은 연구
④ 적절한 결과변수가 보고되지 않은 경우
⑤ 동물실험 및 전임상시험 연구
⑥ 무작위비교임상시험이나 비무작위임상연구가 아닌 연구
⑦ 원저가 아닌 연구
⑧ 초록만 발표된 연구
⑨ 동료심사를 거쳐 학술지에 게재된 연구가 아닌 문헌
⑩ 한국어, 영어로 출판되지 않은 문헌
⑪ 중복 출판 문헌
⑫ 원문 확보 불가 문헌

연번	배제 문헌	배제 사유
1	Azzouni FS, Din R, Rehman S, Khan A, Shi Y, Stegemann A, et al. The first 100 consecutive, robot-assisted, intracorporeal ileal conduits: evolution of technique and 90-day outcomes. European Urology. 2013;63(4):637-43.	③
2	Mmeje CO, Nunez-Nateras R, Nielsen ME, Pruthi RS, Smith A, Wallen EM, et al. Oncologic outcomes for lymph node-positive urothelial carcinoma patients treated with robot assisted radical cystectomy: with mean follow-up of 3.5 years. Urologic Oncology. 2013;31(8):1621-7.	③
3	Chang SL, Jiang W, Chung BI. Trends in the adoption of robotic technology for radical cystectomy: A population-based analysis. Journal of Clinical Oncology. 2012 10 Feb;1).	⑧
4	Desai MM, Berger AK, Brandina RR, Zehnder P, Simmons M, Aron M, et al. Robotic and laparoscopic high extended pelvic lymph node dissection during radical cystectomy: technique and outcomes. European Urology. 2012;61(2):350-5.	③
5	Guillotreau J, Miocinovic R, Gam X, Forest S, Malavaud B, Kaouk J, et al. Outcomes of laparoscopic and robotic radical cystectomy in the elderly patients. Urology. 2012 March;79(3):585-90.	③
6	Lau CS, Talug J, Williams SB, Josephson DY, Ruel NH, Chan KG, et al. Robotic-assisted laparoscopic radical cystectomy in the octogenarian. The International Journal Of Medical Robotics + Computer Assisted Surgery: MRCAS. 2012;8(2):247-52.	③
7	Messer J, Fitzgerald J, Ercole B, Svatek R, Parekh D. Preliminary results of perioperative outcomes and onocoligic efficacy from a single institution randomized controlled trial of open versus robotic assisted radical cystectomy. Journal of Urology. 2012 April;1):e363.	⑧
8	Richards KA, Kader AK, Otto R, Pettus JA, Smith JJ, 3rd, Hemal AK. Is robot-assisted radical cystectomy justified in the elderly? A comparison of robotic versus open radical cystectomy for bladder cancer in elderly 〉75 years old. Journal	⑪

연번	배제 문헌	배제 사유
	of Endourology. 2012;26(10):1301-6.	
9	Torrey RR, Chan KG, Yip W, Josephson DY, Lau CS, Ruel NH, et al. Functional outcomes and complications in patients with bladder cancer undergoing robotic-assisted radical cystectomy with extracorporeal Indiana pouch continent cutaneous urinary diversion. Urology. 2012;79(5):1073-8.	③
10	Udell I, Kurpad R, Smith AB, Woods ME, Wallen E, Nielsen M, et al. Cost analysis of robotic-assisted radical cystectomy versus open radical cystectomy utilizing a prospective, randomized cohort. Journal of the American College of Surgeons. 2012 September;1):S150.	③
11	Yu HY, Hevelone ND, Lipsitz SR, Kowalczyk KJ, Nguyen PL, Choueiri TK, et al. Comparative analysis of outcomes and costs following open radical cystectomy versus robot-assisted laparoscopic radical cystectomy: results from the US Nationwide Inpatient Sample. European Urology. 2012;61(6):1239-44.	⑪
12	Choi H, Kang SH, Yoon DK, Kang SG, Ko HY, Moon DG, et al. Chewing gum has a stimulatory effect on bowel motility in patients after open or robotic radical cystectomy for bladder cancer: A prospective randomized comparative study. Urology. 2011 April;77(4):884-90.	③
13	Davis JW, Gaston K, Anderson R, Dinney CP, Grossman HB, Munsell MF, et al. Robot assisted extended pelvic lymphadenectomy at radical cystectomy: lymph node yield compared with second look open dissection. Journal of Urology. 2011;185(1):79-83.	③
14	Lee R, Chughtai B, Herman M, Shariat SF, Scherr DS. Cost-analysis comparison of robot-assisted laparoscopic radical cystectomy (RC) vs open RC. BJU International. 2011;108(6 Pt 2):976-83.	⑥
15	Lee R, Ng CK, Shariat SF, Borkina A, Guimento R, Brumit KF, et al. The economics of robotic cystectomy: cost comparison of open versus robotic cystectomy. BJU International. 2011;108(11):1886-92.	⑪
16	Niegisch G, Rabenalt R, Albers P. [Robot-assisted radical cystectomy. Pilot study for the prospective evaluation of perioperative parameters compared to open radical cystectomy]. Urologe (Ausg A). 2011;50(9):1076-82.	⑩
17	Martin AD, Nunez RN, Pacelli A, Woods ME, Davis R, Thomas R, et al. Robot-assisted radical cystectomy: intermediate survival results at a mean follow-up of 25 months. BJU International. 2010;105(12):1706-9.	③
18	Richards KA, Hemal AK, Kader AK, Pettus JA. Robot assisted laparoscopic pelvic lymphadenectomy at the time of radical cystectomy rivals that of open surgery: single institution report. Urology. 2010;76(6):1400-4.	⑪
19	Smith A, Kurpad R, Lal A, Nielsen M, Wallen EM, Pruthi RS. Cost Analysis of Robotic Versus Open Radical Cystectomy for Bladder Cancer. Journal of Urology. 2010 February;183(2):505-9. .	⑪
20	Wang GJ, Barocas DA, Raman JD, Scherr DS. Robotic vs open radical cystectomy:	⑪

연번	배제 문헌	배제 사유
	prospective comparison of perioperative outcomes and pathological measures of early oncological efficacy. BJU International. 2008;101(1):89-93.	
21	Sterrett S, Mammen T, Nazemi T, Galich A, Peters G, Smith L, et al. Major urological oncological surgeries can be performed using minimally invasive robotic or laparoscopic methods with similar early perioperative outcomes compared to conventional open methods. World Journal of Urology. 2007;25(2):193-8.	④

3.4. 개별합병증 Forest plot

가. 로봇수술 VS 개복수술

1) 창상열개

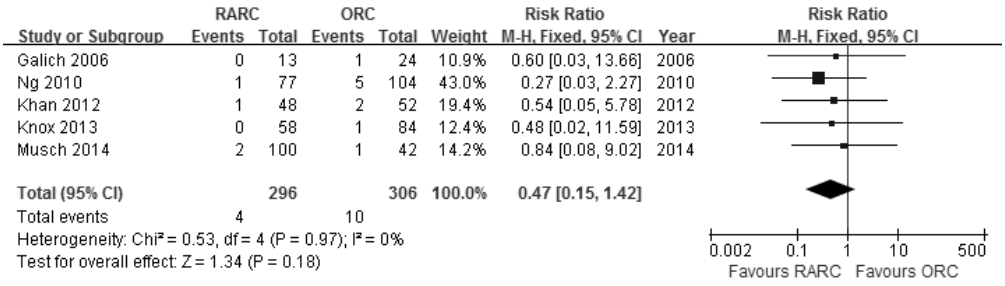


그림 19. [방광암] 창상열개: 로봇수술 vs 개복수술

2) 봉와직염

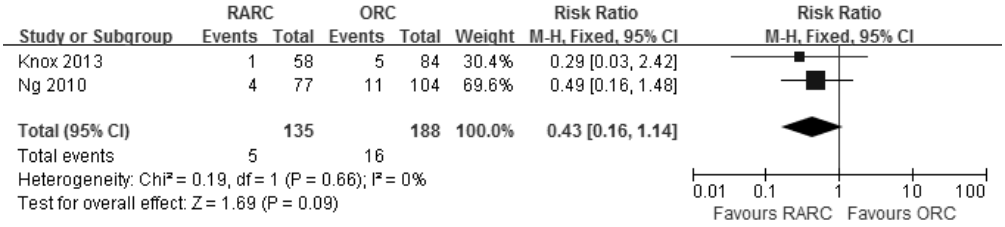


그림 20. [방광암] 봉와직염: 로봇수술 vs 개복수술

3) 출혈

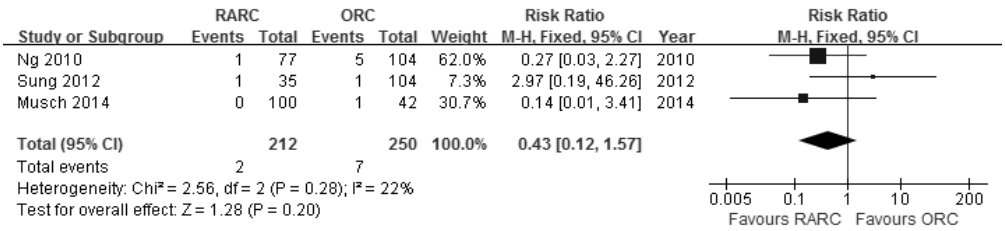


그림 21. [방광암] 출혈: 로봇수술 vs 개복수술

4) 상처감염

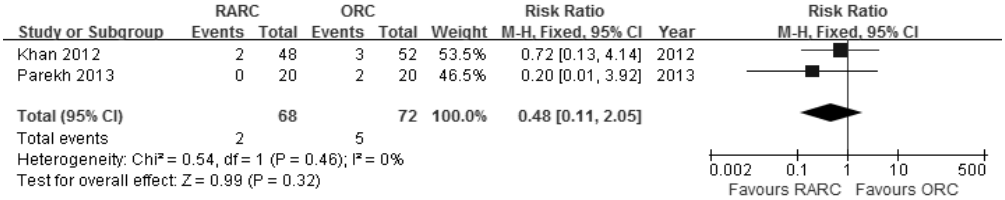


그림 22. [방광암] 상처감염: 로봇수술 vs 개복수술

5) 요로감염

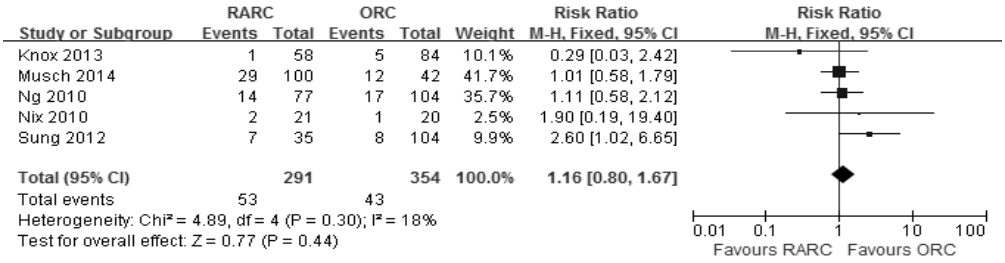


그림 23. [방광암] 요로감염: 로봇수술 vs 개복수술

6) 신부전

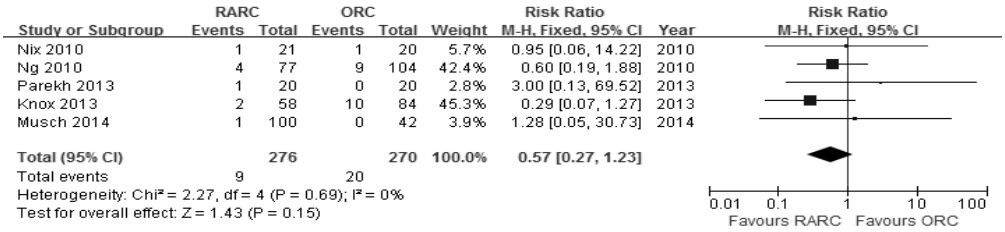


그림 24. [방광암] 신부전: 로봇수술 vs 개복수술

7) 소변누출

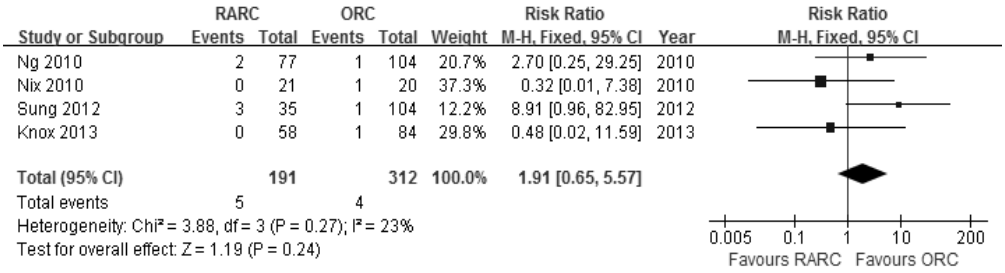


그림 25. [방광암] 소변누출: 로봇수술 vs 개복수술

8) 장 누출

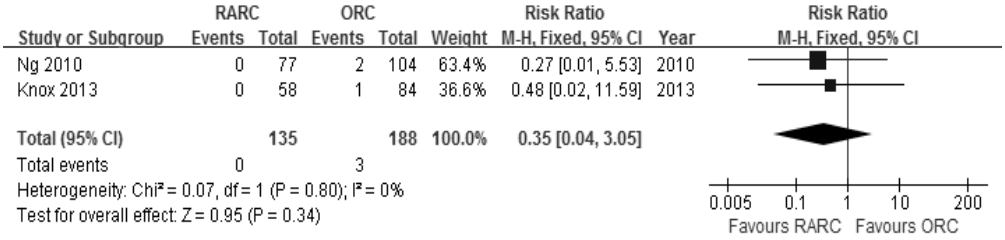


그림 26. [방광암] 장 누출: 로봇수술 vs 개복수술

9) 누공

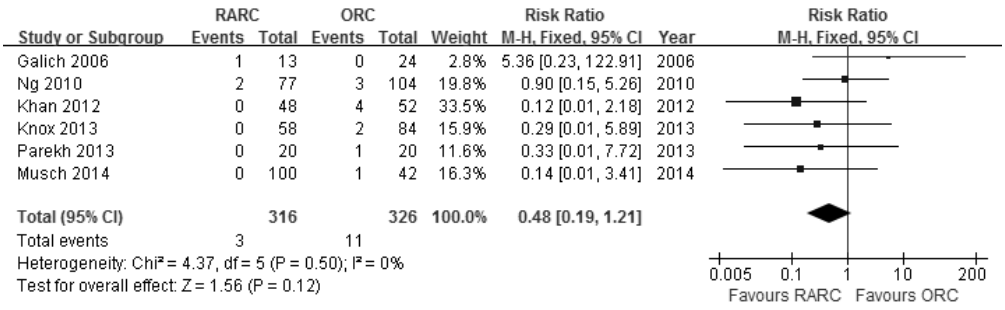


그림 27. [방광암] 누공: 로봇수술 vs 개복수술

10) 장폐색

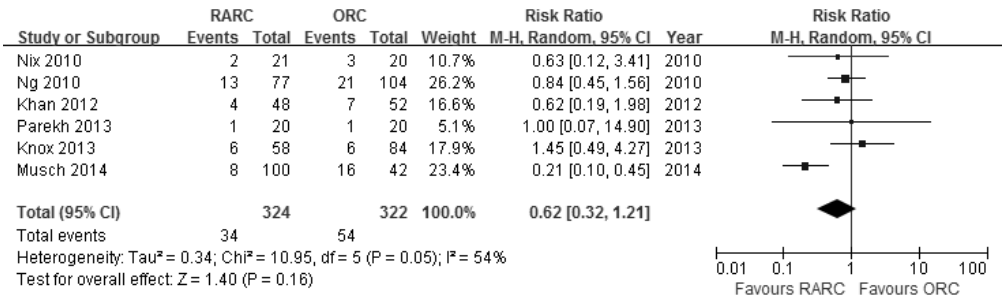


그림 28. [방광암] 장폐색: 로봇수술 vs 개복수술

11) 장폐쇄

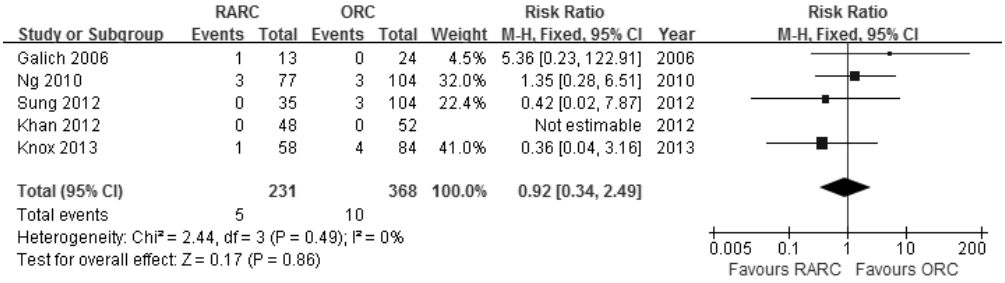


그림 29. [방광암] 장폐쇄: 로봇수술 vs 개복수술

12) 장 손상

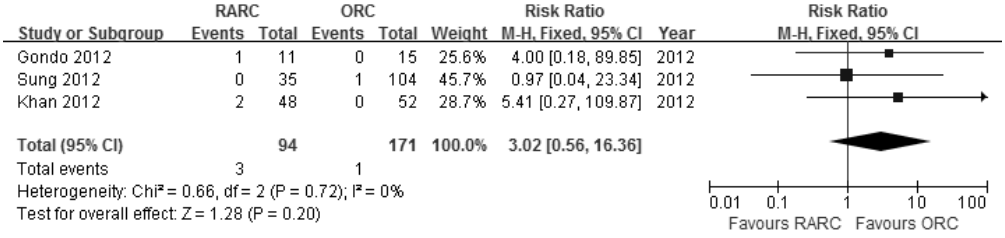


그림 30. [방광암] 장 손상: 로봇수술 vs 개복수술

13) 복막염

그림 31. [방광암] 복막염: 로봇수술 vs 개복수술

14) 색혈전증

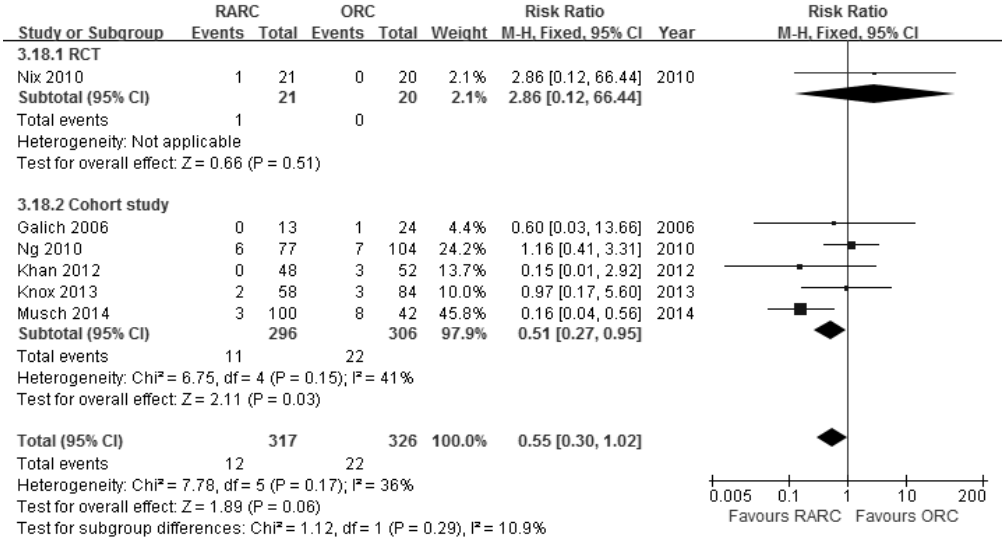


그림 32. [방광암] 색혈전증: 로봇수술 vs 개복수술

15) 폐렴

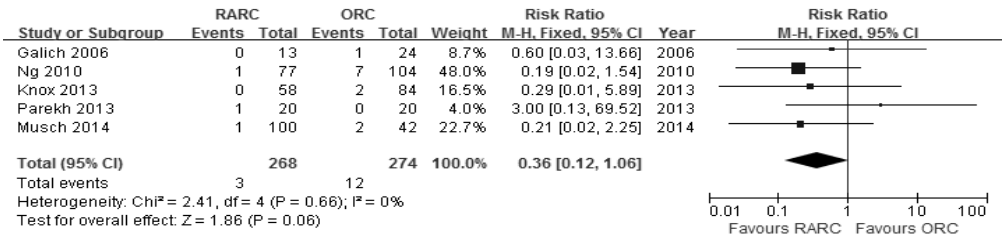


그림 33. [방광암] 폐렴: 로봇수술 vs 개복수술

16) 기흉

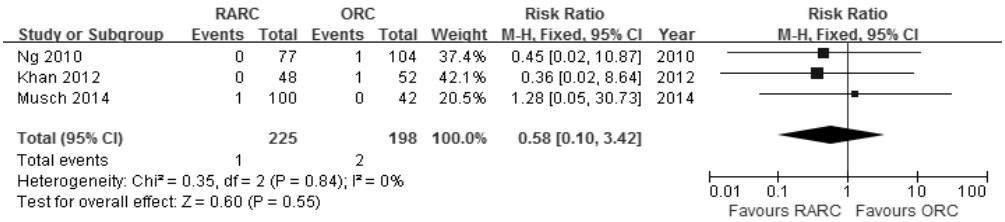


그림 34. [방광암] 기흉: 로봇수술 vs 개복수술

17) 탈장

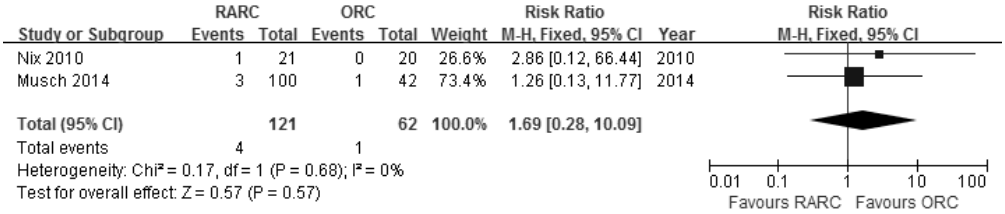


그림 35. [방광암] 탈장: 로봇수술 vs 개복수술

18) 림프류

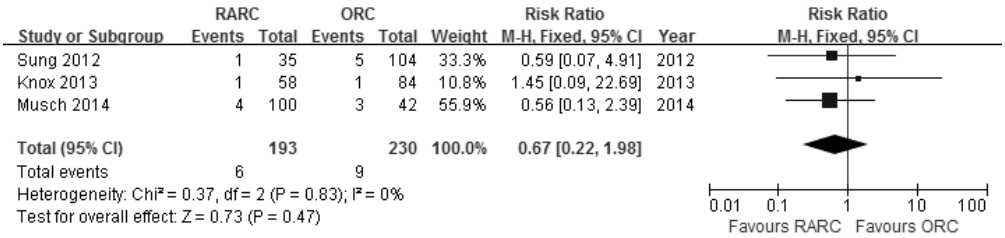


그림 36. 방광암] 림프류: 로봇수술 vs 개복수술

19) 클로스프리디움 디피실 장염

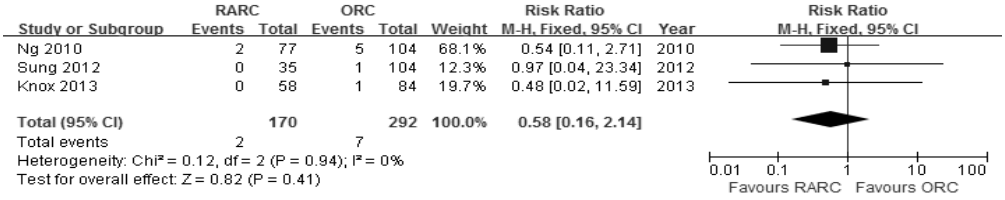


그림 37. [방광암] 클로스프리디움 디피실 장염: 로봇수술 vs 개복수술

20) 심장마비

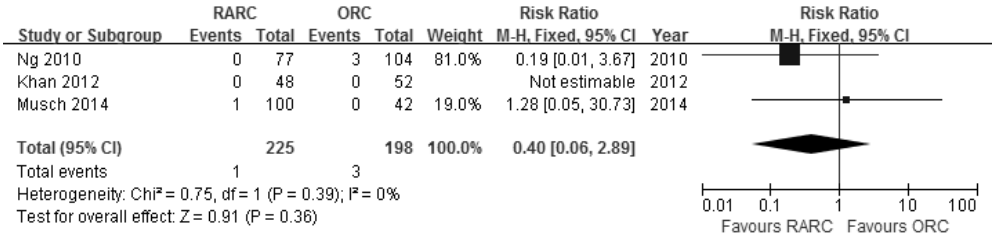


그림 38. [방광암] 심장마비: 로봇수술 vs 개복수술

21) 심방세동

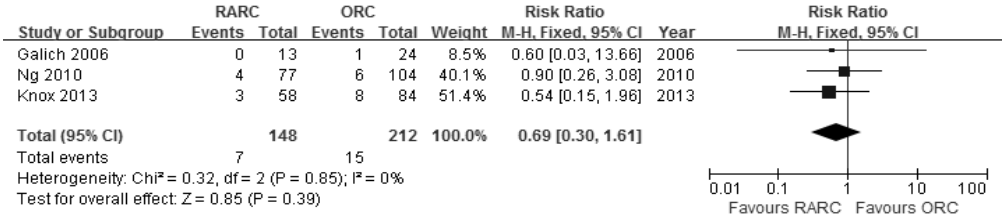


그림 39. [방광암] 심방세동: 로봇수술 vs 개복수술

22) 심부전

그림 40. [방광암] 심부전: 로봇수술 vs 개복수술

23) 심근경색

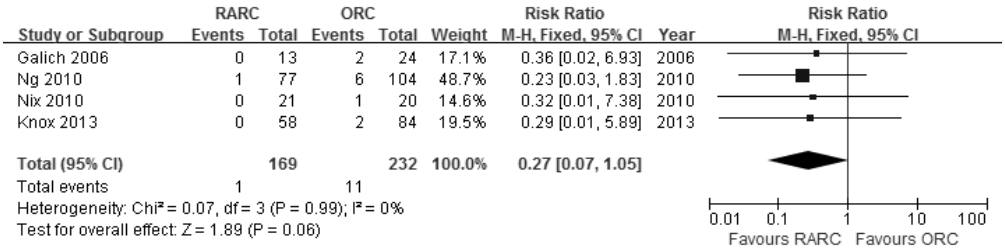


그림 41. [방광암] 심근경색: 로봇수술 vs 개복수술

24) 뇌졸증

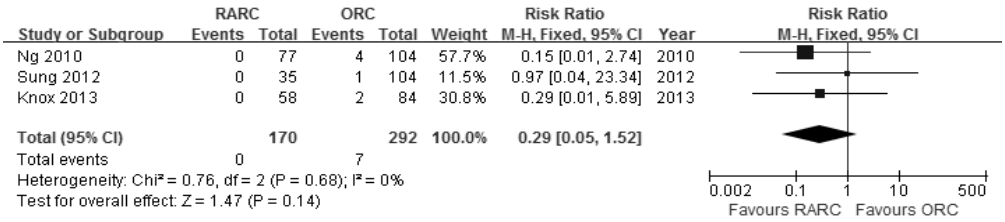


그림 42. [방광암] 뇌졸증: 로봇수술 vs 개복수술

나. 로봇수술 vs 복강경수술

1) 장폐색

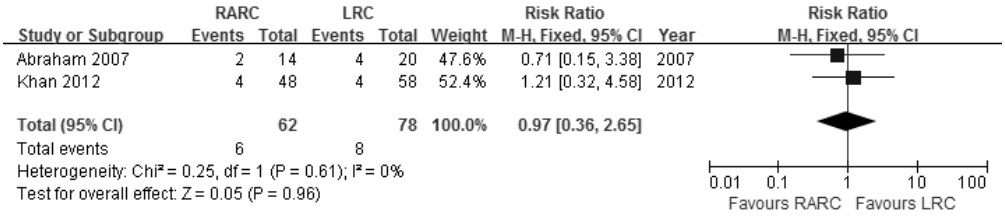


그림 43. [방광암] 장폐색: 로봇수술 vs 복강경수술

2) 장폐쇄

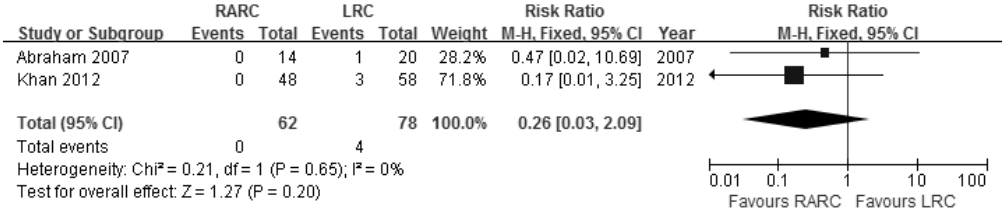


그림 44. [방광암] 장폐쇄: 로봇수술 vs 복강경수술

3) 협착

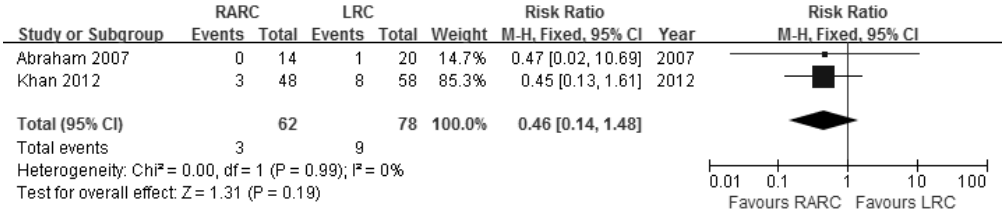


그림 45. [방광암] 협착: 로봇수술 vs 복강경수술

4) 색혈전증

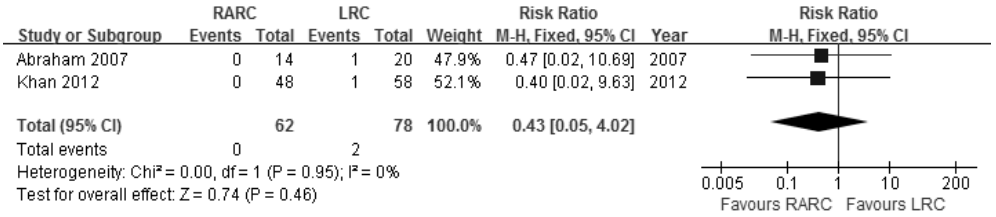


그림 46. [방광암] 색혈전증: 로봇수술 vs 복강경수술

5) 누공/누출

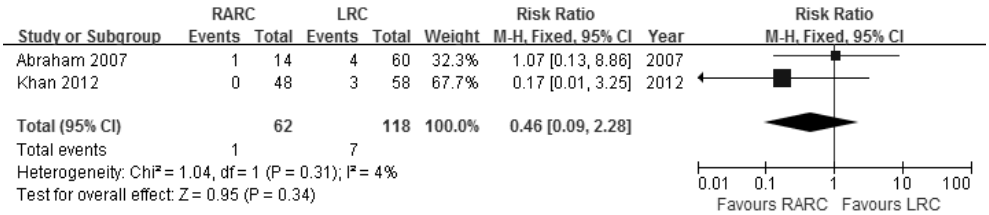


그림 47. [방광암] 누공/누출: 로봇수술 vs 복강경수술

6) 직장 손상

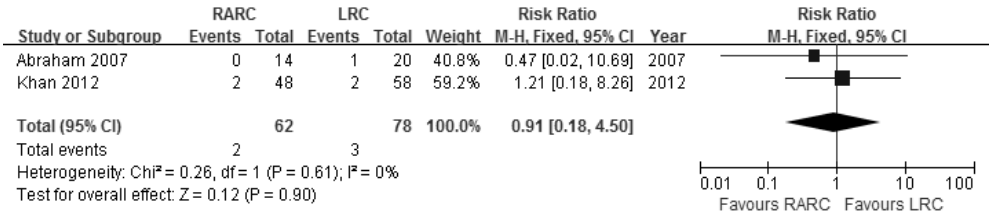


그림 48. [방광암] 누공/누출: 로봇수술 vs 복강경수술

7) 혈관손상

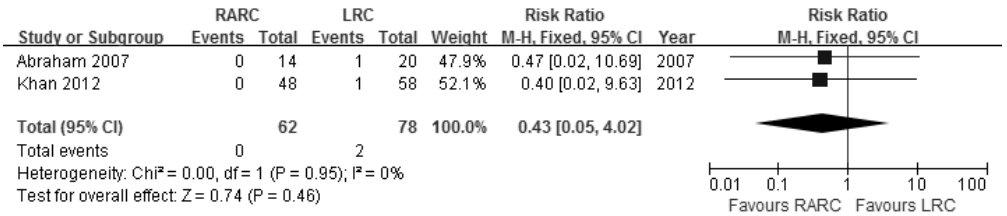


그림 49. [방광암] 혈관손상: 로봇수술 vs 복강경수술

4. 부신암

4.1. 문헌 검색 전략

가. 국외 데이터 베이스 〈검색일자: 2014. 07. 07〉

1) Ovid MEDLINE(R) In-Process &Other Non-Indexed Citations and Ovid MEDLINE(R)1946 to Present

#	Searches	Ovid MEDLINE
1	Robotics.mp. or exp Robotics/	14919
2	Surgery, Computer-assisted.mp. or exp Surgery, Computer-Assisted/	9809
3	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus).mp.	22196
4	1 or 2 or 3	30042
5	exp Adrenal Gland Neoplasms/	23867
6	(adrenal* adj5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)).mp.	27295
7	Adrenocortical carcinoma. mp.	1928
8	adrenalectomy.mp.	21105
9	exp Adrenalectomy/	17575
10	or/5-9	44179
11	4 and 10	138

2) Ovid EMBASE 1974 to 2014 May 19

#	Searches	EMbase
1	robotics.mp. or exp robotics/	23962
2	computer assisted surgery.mp. or exp computer assisted surgery/	6820
3	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus).mp.	34607
4	1 or 2 or 3	39847

5	exp adrenal tumor/	35665
6	exp adrenal cancer/	6411
7	exp adrenal carcinoma/	3905
8	exp adrenalectomy/	21440
9	adrenalectomy.mp.	24135
10	(adrenal* adj5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)).mp.	28912
11	Adrenocortical carcinoma. mp.	2043
12	or/5-10	60839
13	4 and 12	318

3) Cochrane Library

#	Searches	Cochrane
1	MeSH descriptor: [Robotics] explode all trees	513
2	MeSH descriptor: [Surgery, Computer-Assisted] explode all trees	530
3	(Surgery, Computer-assisted):ti,ab,kw	1284
4	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus):ti,ab,kw	1155
5	#1 or #2 or #3 or #4	2328
6	MeSH descriptor: [Adrenal Gland Neoplasms] explode all trees	104
7	((adrenal*) near/5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)):ti,ab,kw	177
8	Adrenocortical carcinoma:ti,ab,kw	15
9	MeSH descriptor: [Adrenalectomy] explode all trees	81
10	#6 or #7 or #8 or #9	215
11	#5 and #10	8

나. 국내 데이터 베이스 〈검색일자: 2014.08.26〉

1) Koreamed

#	Searches	results
1	robot* [ALL] AND adrenal* [ALL]	4
2	telerobot* [ALL] AND adrenal* [ALL]	0
3	remote surg* [ALL] AND adrenal* [ALL]	0
4	remote operat* [ALL] AND adrenal* [ALL]	0
5	davinci [ALL] AND adrenal* [ALL]	0
6	da vinci [ALL] AND adrenal* [ALL]	0
7	zeus [ALL] AND adrenal* [ALL]	0
8	total	11

2) Kmbase

#	Searches	results
1	(robot OR telerobot OR remote surgery OR remote operation OR davinci OR da vinci OR zeus) AND adrenal	5
2	(부신OR 부신암) AND (로봇 OR 다빈치 OR 제우스)	1
3	total	6

3) RISS

#	Searches	results
1	(robot OR telerobot OR remote surgery) AND adrenal	0
2	(remote operation OR davinci OR da vinci) AND adrenal	0
3	zeus AND adrenal	0
4	(로봇 OR 다빈치 OR 제우스) AND 부신	5
5	(로봇 OR 다빈치 OR 제우스) AND 부신암	0
6	total	5

4) KISS

#	Searches	results
1	(robot OR telerobot OR remote surgery OR remote operation OR davinci) AND adrenal	0
2	(da vinci OR zeus) AND adrenal	0
3	(로봇 OR 다빈치 OR 제우스) AND 부신	0
4	(로봇 OR 다빈치 OR 제우스) AND 부신암	0
5	total	0

5) KISTI

#	Searches	results
1	(BI: adrenal*) AND (BI: ROBOT* OR TELEROBOT* OR REMOTE SURG* OR REMOTE OPERAT* OR DA VINCI OR DAVINCI OR ZEUS)	0
2	(BI:부신 OR 부신암) AND (BI:로봇 OR 다빈치 OR 제우스)	0
3	total	0

4.2. 최종 선택문헌 목록

- 없음

4.3. 문헌배제사유 및 배제문헌 목록

① 부신암 대상이 아닌 문헌
② 로봇을 이용한 부신절제술이 대상이 아닌 문헌
③ 개복수술이나 복강경수술과 비교 분석되지 않은 연구
④ 적절한 결과변수가 보고되지 않은 경우
⑤ 동물실험 및 전임상시험 연구
⑥ 무작위비교임상시험이나 비무작위임상연구가 아닌 연구
⑦ 원저가 아닌 연구
⑧ 초록만 발표된 연구
⑨ 동료심사를 거쳐 학술지에 게재된 연구가 아닌 문헌
⑩ 한국어, 영어로 출판되지 않은 문헌
⑪ 중복 출판 문헌
⑫ 원문 확보 불가 문헌

연번	배제 문헌	배제 사유
1	Raffaelli M, Brunaud L, De Crea C, Hoche G, Oragano L, Bresler L, et al. Synchronous bilateral adrenalectomy for Cushing's syndrome: laparoscopic versus	①

	posterior retroperitoneoscopic versus robotic approach. World Journal of Surgery. 2014;38(3):709-15.	
2	You JY, Lee HY, Son GS, Lee JB, Bae JW, Kim HY. Comparison of robotic adrenalectomy with traditional laparoscopic adrenalectomy with a lateral transperitoneal approach: a single-surgeon experience. The International Journal Of Medical Robotics + Computer Assisted Surgery: MRCAS. 2013;9(3):345-50.	①
3	Salman M, Bell T, Martin J, Bhuva K, Grim R, Ahuja V. Use, cost, complications, and mortality of robotic versus nonrobotic general surgery procedures based on a nationwide database. American Surgeon. 2013;79(6):553-60.	①
4	Aksoy E, Taskin HE, Aliyev S, Mitchell J, Siperstein A, Berber E. Robotic versus laparoscopic adrenalectomy in obese patients. Surgical Endoscopy. 2013;27(4):1233-6.	①
5	Pineda-Solis K, Medina-Franco H, Heslin MJ. Robotic versus laparoscopic adrenalectomy: a comparative study in a high-volume center. Surgical Endoscopy. 2013;27(2):599-602.	①
6	Agcaoglu O, Aliyev S, Karabulut K, Mitchell J, Siperstein A, Berber E. Robotic versus laparoscopic resection of large adrenal tumors. Annals of Surgical Oncology. 2012;19(7):2288-94.	①
7	Agcaoglu O, Aliyev S, Karabulut K, Siperstein A, Berber E. Robotic vs laparoscopic posterior retroperitoneal adrenalectomy. Archives of Surgery. 2012;147(3):272-5.	①
8	Karabulut K, Agcaoglu O, Aliyev S, Siperstein A, Berber E. Comparison of intraoperative time use and perioperative outcomes for robotic versus laparoscopic adrenalectomy. Surgery. 2012;151(4):537-42.	①
9	Berber E, Mitchell J, Milas M, Siperstein A. Robotic posterior retroperitoneal adrenalectomy: operative technique. Archives of Surgery. 2010;145(8):781-4.	3
10	Brunaud L, Bresler L, Ayav A, Zarnegar R, Raphoz AL, Levan T, et al. Robotic-assisted adrenalectomy: what advantages compared to lateral transperitoneal laparoscopic adrenalectomy? American Journal of Surgery. 2008;195(4):433-8.	①
11	Wu JC, Wu HS, Lin MS, Chou DA, Huang MH. Comparison of robot-assisted laparoscopic adrenalectomy with traditional laparoscopic adrenalectomy - 1 year follow-up. Surgical Endoscopy. 2008;22(2):463-6.	①
12	Morino M, Beninca G, Giraudo G, Del Genio GM, Rebecchi F, Garrone C. Robot-assisted vs laparoscopic adrenalectomy: a prospective randomized controlled trial. Surgical Endoscopy. 2004;18(12):1742-6.	①
13	Brunaud L, Bresler L, Zarnegar R, Ayav A, Cormier L, Tretou S, et al. Does robotic adrenalectomy improve patient quality of life when compared to laparoscopic adrenalectomy? World Journal of Surgery. 2004;28(11):1180-5.	①
14	Brunaud L, Bresler L, Ayav A, Tretou S, Cormier L, Klein M, et al. [Advantages of using robotic Da Vinci system for unilateral adrenalectomy: early results]. Annales de Chirurgie. 2003;128(8):530-5.	⑩

15	Tsang YP, Tsui DK, Yau KK. Robotic-assisted adrenalectomy for benign adrenal tumour. Surgical Practice. 2012 August;16(3):118-9.	⑩
16	Aliyev S, Karabulut K, Agcaoglu O, Wolf K, Mitchell J, Siperstein A, et al. Robotic versus laparoscopic adrenalectomy for pheochromocytoma. Annals of Surgical Oncology. 2013;20(13):4190-4.	①
17	Cadeddu JA. Robot-assisted posterior retroperitoneoscopic adrenalectomy. Journal of Urology. 2011 January;185(1):97.	③
18	Nayyar R, Singh P, Gupta NP. Robotic management of pheochromocytoma of the vesicoureteric junction. JSLS : Journal of the Society of Laparoendoscopic Surgeons / Society of Laparoendoscopic Surgeons. 2010 2010;14(2):309-12.	⑥
19	Dasgupta P, Jones A, Gill IS. Robotic urological surgery: A perspective. BJU International, Supplement. 2005;95(1):20-3.	⑦
20	Ayav A, Bresler L, Brunaud L, Boissel P. Early results of one-year robotic surgery using the Da Vinci system to perform advanced laparoscopic procedures. Journal of Gastrointestinal Surgery. 2004 10 Sep;8(6):720-6.	①
21	Joseph JV, Patel HRH. Robot-assisted laparoscopic adrenalectomy: Preliminary UK results [5]. BJU International. 2004 July;94(1):193.	⑥

4.4. 개별합병증 Forest plot

- 없음

5. 신우요관암

5.1. 문헌 검색 전략

가. 국외 데이터 베이스 〈검색일자: 2014. 07. 07〉

1) Ovid MEDLINE(R) In-Process &Other Non-Indexed Citations and Ovid MEDLINE(R)1946 to Present

#	Searches	Ovid MEDLINE
1	Robotics.mp. or exp Robotics/	14919
2	Surgery, Computer-assisted.mp. or exp Surgery, Computer-Assisted/	9809
3	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus).mp.	22196
4	1 or 2 or 3	30042
5	exp Ureteral Neoplasms/	4038
6	(ureter* adj5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)).mp.	6080
7	(renal pelvic* adj5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)).mp.	689
8	(nephroureterectomy or ureterectomy.)mp.	2274
9	or/5-8	7627
10	4 and 9	97

2) Ovid EMBASE 1974 to 2014 May 19

#	Searches	EMbase
1	robotics.mp. or exp robotics/	23962
2	computer assisted surgery.mp. or exp computer assisted surgery/	6820
3	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus).mp.	34607
4	1 or 2 or 3	39847

5	exp ureter tumor/	3620
6	exp ureter cancer/	1479
7	exp ureter carcinoma/	837
8	exp nephroureterectomy/	2902
9	(nephroureterectomy or ureterectomy.)mp.	4159
10	(ureter* adj5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)).mp.	8361
11	(renal pelvic* adj5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)).mp.	909
12	or/5-11	11283
13	4 and 12	402

3) Cochrane Library

#	Searches	Cochrane
1	MeSH descriptor: [Robotics] explode all trees	513
2	MeSH descriptor: [Surgery, Computer-Assisted] explode all trees	530
3	(Surgery, Computer-assisted):ti,ab,kw	1284
4	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus):ti,ab,kw	1155
5	#1 or #2 or #3 or #4	2328
6	MeSH descriptor: [Ureteral Neoplasms] explode all trees	8
7	((ureter*) near/5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)):ti,ab,kw	28
8	((renal pelvic*) near/5 (neoplas* or cancer or carcinoma* or macrocarcinoma* or tumo?r* or malignan*)):ti,ab,kw	2
9	nephroureterectomy:ti,ab,kw	15
10	#6 or #7 or #8 #9	28
11	#5 and #10	0

나. 국내 데이터 베이스 〈검색일자: 2014.08.26〉

1) Koreamed

#	Searches	results
1	robot* [ALL] AND renal pelvic* [ALL]	0
2	telerobot* [ALL] AND renal pelvic* [ALL]	0
3	remote surg* [ALL] AND renal pelvic* [ALL]	0
4	remote operat* [ALL] AND renal pelvic* [ALL]	0
5	davinci [ALL] AND renal pelvic* [ALL]	0
6	da vinci [ALL] AND renal pelvic* [ALL]	0
7	zeus [ALL] AND renal pelvic* [ALL]	0
8	robot* [ALL] AND ureter* [ALL]	11
9	telerobot* [ALL] AND ureter* [ALL]	0
10	remote surg* [ALL] AND ureter* [ALL]	0
11	remote operat* [ALL] AND ureter* [ALL]	0
12	davinci [ALL] AND ureter* [ALL]	0
13	da vinci [ALL] AND ureter* [ALL]	0
14	zeus [ALL] AND ureter* [ALL]	0
15	total	11

2) Kmbase

#	Searches	results
1	(robot OR telerobot OR remote surgery OR remote operation OR davinci OR da vinci OR zeus) AND renal pelvic	0
2	(신우OR 신우암) AND (로봇 OR 다빈치 OR 제우스)	1
3	(robot OR telerobot OR remote surgery OR remote operation OR davinci OR da vinci OR zeus) AND ureter	10
4	(요관OR 요관암) AND (로봇 OR 다빈치 OR 제우스)	1
5	total	12

3) RISS

#	Searches	results
1	(robot OR telerobot OR remote surgery) AND renal pelvic	0
2	(remote operation OR davinci OR da vinci) AND renal pelvic	0
3	zeus AND renal pelvic	0
4	(로봇 OR 다빈치 OR 제우스) AND 신우	0
5	(로봇 OR 다빈치 OR 제우스) AND 신우암	0
6	(robot OR telerobot OR remote surgery) AND ureter	0
7	(remote operation OR davinci OR da vinci) AND ureter	0
8	zeus AND ureter	0
9	(로봇 OR 다빈치 OR 제우스) AND 요관	0
10	(로봇 OR 다빈치 OR 제우스) AND 요관암	0
11	total	0

4) KISS

#	Searches	results
1	(robot OR telerobot OR remote surgery OR remote operation OR davinci) AND renal pelvic	0
2	(da vinci OR zeus) AND renal pelvic	0
3	(로봇 OR 다빈치 OR 제우스) AND 신우	0
4	(로봇 OR 다빈치 OR 제우스) AND 신우암	0
5	(robot OR telerobot OR remote surgery OR remote operation OR davinci) AND ureter	0
6	(da vinci OR zeus) AND ureter	0
7	(로봇 OR 다빈치 OR 제우스) AND 요관	0
8	(로봇 OR 다빈치 OR 제우스) AND 요관암	0
9	total	0

5) KISTI

#	Searches	results
1	(BI: renal pelvic*) AND (BI: ROBOT* OR TELEROBOT* OR REMOTE SURG* OR REMOTE OPERAT* OR DA VINCI OR DAVINCI OR ZEUS)	0
2	(BI:신우 OR 신우암) AND (BI:로봇 OR 다빈치 OR 제우스)	0

3	(BI: ureter*) AND (BI: ROBOT* OR TELEROBOT* OR REMOTE SURG* OR REMOTE OPERAT* OR DA VINCI OR DAVINCI OR ZEUS)	0
4	(BI:요관 OR 요관암) AND (BI:로봇 OR 다빈치 OR 제우스)	0
5	total	0

5.2. 최종 선택문헌 목록

연번	1저자	연도	제목	저널
1	Ambani	2014	Matched Comparison of Robotic vs Laparoscopic Nephroureterectomy: An Initial Experience	Laparoscopy and Robotics
2	Rao	2012	Prospective clinical trial of the feasibility and safety of modified retroperitoneal lymph node dissection at time of nephroureterectomy for upper tract urothelial carcinoma	BJU INTERNATIONAL

5.3. 문헌배제사유 및 배제문헌 목록

① 신우요관암 대상이 아닌 문헌
② 로봇을 이용한 신우요관절제술이 대상이 아닌 문헌
③ 개복수술이나 복강경수술과 비교 분석되지 않은 연구
④ 적절한 결과변수가 보고되지 않은 경우
⑤ 동물실험 및 전임상시험 연구
⑥ 무작위비교임상시험이나 비무작위임상연구가 아닌 연구
⑦ 원저가 아닌 연구
⑧ 초록만 발표된 연구
⑨ 동료심사를 거쳐 학술지에 게재된 연구가 아닌 문헌
⑩ 한국어, 영어로 출판되지 않은 문헌
⑪ 중복 출판 문헌
⑫ 원문 확보 불가 문헌

연번	배제 문헌	배제 사유
1	Lim SK, Shin TY, Kim KH, Han WK, Chung BH, Hong SJ, et al. Laparoendoscopic single-site (LESS) robot-assisted nephroureterectomy: comparison with conventional multiport technique in the management of upper urinary tract	③

	urothelial carcinoma. BJU International. 2014;114(1):90-7.	
2	Lee Z, Llukani E, Reilly CE, Mydlo JH, Lee DI, Eun DD. Single surgeon experience with robot-assisted ureteroureterostomy for pathologies at the proximal, middle, and distal ureter in adults. Journal of Endourology. 2013;27(8):994-9.	③
3	Khemees TA, Nasser SM, Abaza R. Clinical pathway after robotic nephroureterectomy: omission of pelvic drain with next-day catheter removal and discharge. Urology. 2014;83(4):818-23.	⑦
4	Bansal D, Cost NG, Bean CM, Riachy E, Defoor WR, Jr., Reddy PP, et al. Comparison of pediatric robotic-assisted laparoscopic nephroureterectomy and laparoendoscopic single-site nephroureterectomy. Urology. 2014;83(2):438-42.	①
5	Pugh J, Parekattil S, Willis D, Stifelman M, Hemal A, Su LM. Perioperative outcomes of robot-assisted nephroureterectomy for upper urinary tract urothelial carcinoma: a multi-institutional series. BJU International. 2013;112(4):E295-300.	③
6	Musch M, Hohenhorst L, Pailliart A, Loewen H, Davoudi Y, Kroepfl D. Robot-assisted reconstructive surgery of the distal ureter: single institution experience in 16 patients. BJU International. 2013;111(5):773-83.	③
7	Lee Z, Cadillo-Chavez R, Lee DI, Llukani E, Eun D. The technique of single stage pure robotic nephroureterectomy. Journal of Endourology. 2013;27(2):189-95.	⑦
8	Ribal MJ, Huguet J, Alcaraz A. Oncologic outcomes obtained after laparoscopic, robotic and/or single port nephroureterectomy for upper urinary tract tumours. World Journal of Urology. 2013;31(1):93-107. PubMed PMID: 23097034.	⑦
9	Ou YC, Yang CR, Yang CK, Cheng CL, Hemal AK. Simultaneous robot-assisted nephroureterectomy and cystectomy in patients with uremia and multifocal urothelial carcinoma. Journal of Endourology. 2011;25(6):979-84.	③
10	Hemal AK, Nayyar R, Gupta NP, Dorairajan LN. Experience with robot assisted laparoscopic surgery for upper and lower benign and malignant ureteral pathologies. Urology. 2010;76(6):1387-93.	③
11	Eandi JA, Nelson RA, Wilson TG, Josephson DY. Oncologic outcomes for complete robot-assisted laparoscopic management of upper-tract transitional cell carcinoma. Journal of Endourology. 2010;24(6):969-75.	③
12	Pena Gonzalez JA, Pascual Queralt M, Salvador Bayarri JT, Rosales Bordes A, Palou Redorta J, Villavicencio Mavrich H. [Evolution of open versus laparoscopic/robotic surgery: 10 years of changes in urology]. Actas Urologicas Espanolas. 2010;34(3):223-31.	④
13	Glinianski M, Guru KA, Zimmerman G, Mohler J, Kim HL. Robot-assisted ureterectomy and ureteral reconstruction for urothelial carcinoma. Journal of Endourology. 2009;23(1):97-100.	③
14	Hu JC, Silletti JP, Williams SB. Initial experience with robot-assisted minimally-invasive nephroureterectomy. Journal of Endourology. 2008;22(4):699-704.	③

15	Mufarrij PW, Shah OD, Berger AD, Stifelman MD. Robotic reconstruction of the upper urinary tract. Journal of Urology. 2007;178(5):2002-5.	①
16	Emara AM, Kommu SS, Hindley RG, Barber NJ. Robot-assisted partial nephrectomy vs laparoscopic cryoablation for the small renal mass: Redefining the minimally invasive 'gold standard'. BJU International. 2014 January;113(1):92-9.	①
17	Xylinas E, Roupret M, Shariat SF. Segmental ureterectomy for upper tract urothelial carcinoma: Two procedures with different indications. Urologic Oncology: Seminars and Original Investigations. 2013 November;31(8):1841-3.	⑦
18	Park SY, Rha KH, Autorino R, Derweesh I, Liastikos E, Tsai YC, et al. Laparoendoscopic single-site nephroureterectomy for upper urinary tract urothelial carcinoma: Outcomes of an international multi-institutional study of 101 patients. BJU International. 2013 September;112(5):610-5.	②
19	Lee Z, Sehgal S, Llukani E, Reilly C, Doumanian L, Mydlo J, et al. Single-surgeon experience with robot-assisted ureteroneocystostomy for distal ureteral pathologies in adults. Korean Journal of Urology. 2013 June;54(8):516-21.	③
20	Santomauro M, Stroup SP. Improving urologic cancer care through telemedicine. Expert Review of Anticancer Therapy. 2013 July;13(7):773-5.	①
21	Varshney A. Advances in endourology. Journal International Medical Sciences Academy. 2011 July-September;24(3):109.	⑦
22	Are LESS and NOTES ready for prime time in urology? Supplement shares state-of-the-art experiences and technical challenges. BJU International. 2010 September;106(6):ii-vii.	②
23	Hemal AK, Kumar A, Gupta NP, Seth A. Retroperitoneal nephroureterectomy with excision of cuff of the bladder for upper urinary tract transitional cell carcinoma: Comparison of laparoscopic and open surgery with long-term follow-up. World Journal of Urology. 2008;26(4):381-6.	②
24	Pansadoro V. Laparoscopic surgery in urological oncology. European Journal of Cancer, Supplement. 2007 September;5(5):383-4.	⑦
25	Pedraza R, Palmer L, Moss V, Franco I. Bilateral robotic assisted laparoscopic heminephroureterectomy. Journal of Urology. 2004 June;171(6 I):2394-5.	⑥
26	Williams RD. What's new in urology. Journal of the American College of Surgeons. 2002 01 Nov;195(5):663-74.	⑧

5.4. 개별합병증 Forest plot

- 없음

6. 자궁암

6.1. 문헌 검색 전략

가. 국외 데이터 베이스

1) Ovid MEDLINE(R) In-Process &Other Non-Indexed Citations and Ovid MEDLINE(R)1946 to Present (2014.5.20)

구분	#	검색어	검색결과
Intervention	1	Robotic.mp. or exp Robotics/	17307
	2	Surgery, Computer-assisted.mp. or exp Surgery, Computer-Assisted/	9552
	3	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus).mp.	21618
	4	1 or 2 or 3	29235
Patient	5	exp Uterine Neoplasms/	102842
	6	((endometr* or uter* or cervi* or gynae* or gyne*) adj5 (neoplas* or cancer* or carcinom* or macrocarcinom* or microcarcinom* or tumo?r* or malignan* or adenocarcinoma* or carcinosarcoma* or sarcoma*)).mp.	141165
	7	(hysterectom* or trachelectom*).mp.	36926
	8	5 or 6 or 7	163613
P&I	9	4 and 8	686
	10	animal/ not human/	3845521
P&I&Human	11	9 not 10	682

2) Ovid EMBASE 1974 to 2014 May 19

구분	#	검색어	검색결과
Intervention	1	Robotic.mp. or exp Robotics/	29601
	2	computer assisted surgery.mp. or exp computer assisted surgery/	6745
	3	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus).mp.	33529
	4	1 or 2 or 3	38708
Patient	5	exp Uterus cancer/	108169
	6	((endometr* or uter* or cervi* or gynae* or gyne*) adj5 (neoplas*	197522

		or cancer* or carcinom* or macrocarcinom* or microcarcinom* or tumo?r* or malignan* or adenocarcinoma* or carcinosarcoma* or sarcoma*)).mp.	
	7	(hysterectom* or trachelectom*).mp.	54821
	8	5 or 6 or 7	231157
P&I	9	4 and 8	1778
	10	animal/ not human/	1188049
P&I&Human	11	9 not 10	1777

3) Cochrane Library (2014.5.20)

구분	#	검색어	검색결과
Intervention	1	MeSH descriptor: [Robotics] explode all trees	512
	2	MeSH descriptor: [Surgery, Computer-Assisted] explode all trees	529
	3	(Surgery, Computer-assisted):ti,ab,kw	1827
	4	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus):ti,ab,kw	1648
	5	#1 or #2 or #3 or #4	3325
Patient	6	MeSH descriptor: [Uterine Neoplasms] explode all trees	2683
	7	((endometr* or uter* or cervi* or gynae* or gyne*) near/5 (neoplas* or cancer* or carcinom* or macrocarcinom* or microcarcinom* or tumo?r* or malignan* or adenocarcinoma* or carcinosarcoma* or sarcoma*)):ti,ab,kw	7225
	8	(hysterectom* or trachelectom*):ti,ab,kw	3428
	9	#6 or #7 or #8	9924
P&I	10	#5 and #9	142
		Cochrane review 70; Other reviews 3; Trials 38 ; Technology Assessments 12; Economic Evaluations 19	38

나. 국내 데이터 베이스

1) KoreaMed (2014.5.20)

#	검색어	검색결과
1	robot* AND (endometr* OR uter* OR cervi* OR gynae* OR gyne*)	27
2	telerobot* AND (endometr* OR uter* OR cervi* OR gynae* OR gyne*)	1
3	remote surg* AND (endometr* OR uter* OR cervi* OR gynae* OR gyne*)	3
4	remote operation* AND (endometr* OR uter* OR cervi* OR gynae* OR gyne*)	0

5	davinci AND (endometr* OR uter* OR cervi* OR gynae* OR gyne*)	0
6	da vinci AND (endometr* OR uter* OR cervi* OR gynae* OR gyne*)	8
7	Zeus AND (endometr* OR uter* OR cervi* OR gynae* OR gyne*)	0
8	중복 제거 최종	29

2) KMbase (2014.5.20)

#	검색어	검색결과
1	(cervi or endometri or uter or gyne or gynae) AND (robot or telerobot or remote or vinci or davinci or zeus	58
2	(자궁 or 부인) AND (로봇 or 다빈치)	7
3	중복 제거 최종	59

3) KISS (2014.5.20)

#	검색어	검색결과 (의약학분야)
1	(cervi or endometri or uter or gyne or gynae) 결과내재검색 robot	44
2	(cervi or endometri or uter or gyne or gynae) 결과내재검색 telerobot	0
3	(cervi or endometri or uter or gyne or gynae) 결과내재검색 remote	0
4	(cervi or endometri or uter or gyne or gynae) 결과내재검색 vinci	3
5	(cervi or endometri or uter or gyne or gynae) 결과내재검색 davinci	0
6	(cervi or endometri or uter or gyne or gynae) 결과내재검색 zeus	0
7	(자궁 or 부인) 결과내재검색 로봇	8
8	(자궁 or 부인) 결과내재검색 다빈치	0
9	중복 제거 최종	54

4) RISS (2014.5.21)

#	검색어	검색결과 〈국내학술지 검색〉
1	(cervi or endometri or uter) 결과내 재검색 robot	7
2	(cervi or endometri or uter) 결과내 재검색 telerobot	0
3	(cervi or endometri or uter) 결과내 재검색 remote	0
4	(cervi or endometri or uter) 결과내 재검색 vinci	1
5	(cervi or endometri or uter) 결과내 재검색 davinci	0

6	(cervi or endometri or uter) 결과내 재검색 zeus	0
7	(gyne or gynae)	17
8	자궁 AND 로봇	8
9	자궁 AND 다빈치	3
10	부인 AND 로봇	6
11	부인 AND 다빈치	0
12	중복 제거 최종	39

5) KISTI (2014.5.21)

#	검색어	검색결과
1	(BI: cervical cancer* or BI: endometrial cancer* or BI: uterine cancer*) 결과내재검색 robot	10
2	(BI: cervical cancer* or BI: endometrial cancer* or BI: uterine cancer*) 결과내재검색 telerobot	0
3	(BI: cervical cancer* or BI: endometrial cancer* or BI: uterine cancer*) 결과내재검색 remote	9
4	(BI: cervical cancer* or BI: endometrial cancer* or BI: uterine cancer*) 결과내재검색 vinci	5
5	(BI: cervical cancer* or BI: endometrial cancer* or BI: uterine cancer*) 결과내재검색 davinci	1
6	(BI: cervical cancer* or BI: endometrial cancer* or BI: uterine cancer*) 결과내재검색 zeus	0
7	(BI: gynecological cancer* or BI: gynaecological cancer*) 결과내재검색 robot	1
8	(BI: gynecological cancer* or BI: gynaecological cancer*) 결과내재검색 telerobot	0
9	(BI: gynecological cancer* or BI: gynaecological cancer*) 결과내재검색 remote	0
10	(BI: gynecological cancer* or BI: gynaecological cancer*) 결과내재검색 vinci	0
11	(BI: gynecological cancer* or BI: gynaecological cancer*) 결과내재검색 davinci	0
12	(BI: gynecological cancer* or BI: gynaecological cancer*) 결과내재검색 zeus	0
13	(BI: 자궁* OR BI: 부인*) 결과내재검색 로봇	9
14	(BI: 자궁* OR BI: 부인*) 결과내재검색 다빈치	3
15	중복 제거 최종	15

6.2. 최종 선택문헌 목록

No	선택 문헌
1	Bell MC, Torgerson J, Seshadri-Kreaden U, Suttle AW, Hunt S, Bell MC et al. Comparison of outcomes and cost for endometrial cancer staging via traditional laparotomy, standard laparoscopy and robotic techniques. Gynecol Oncol 2008; 111(3):407-411.
2	Bernardini MQ, Gien LT, Tipping H, Murphy J, Rosen BP, Bernardini MQ et al. Surgical outcome of robotic surgery in morbidly obese patient with endometrial cancer compared to laparotomy. Int J Gynecol Cancer 2012; 22(1):76-81.
3	Boggess JF, Gehrig PA, Cantrell L, Shafer A, Ridgway M, Skinner EN et al. A case-control study of robot-assisted type III radical hysterectomy with pelvic lymph node dissection compared with open radical hysterectomy. Am J Obstet Gynecol 2008; 199(4):357.
4	Boggess JF, Gehrig PA, Cantrell L, Shafer A, Ridgway M, Skinner EN et al. A comparative study of 3 surgical methods for hysterectomy with staging for endometrial cancer: robotic assistance, laparoscopy, laparotomy. Am J Obstet Gynecol 2008; 199(4):360-369.
5	Cantrell LA, Mendivil A, Gehrig PA, Boggess JF, Cantrell LA, Mendivil A et al. Survival outcomes for women undergoing type III robotic radical hysterectomy for cervical cancer: a 3-year experience. Gynecol Oncol 2010; 117(2):260-265.
6	Cardenas-Goicoechea J, Shepherd A, Momeni M, Mandeli J, Chuang L, Gretz H et al. Survival analysis of robotic versus traditional laparoscopic surgical staging for endometrial cancer. Am J Obstet Gynecol 2014; 210(2):160.
7	Cardenas-Goicoechea J, Soto E, Chuang L, Gretz H, Randall TC, Cardenas-Goicoechea J et al. Integration of robotics into two established programs of minimally invasive surgery for endometrial cancer appears to decrease surgical complications. Journal of Gynecologic Oncology 2013; 24(1):21-28.
8	Chong GO, Lee YH, Hong DG, Cho YL, Park IS, Lee YS et al. Robot versus laparoscopic nerve-sparing radical hysterectomy for cervical cancer: a comparison of the intraoperative and perioperative results of a single surgeon's initial experience. Int J Gynecol Cancer 2013; 23(6):1145-1149.
9	Coronado PJ, Herraiz MA, Magrina JF, Fasero M, Vidart JA, Coronado PJ et al. Comparison of perioperative outcomes and cost of robotic-assisted laparoscopy, laparoscopy and laparotomy for endometrial cancer. Eur J Obstet Gynecol Reprod Biol 2012; 165(2):289-294.
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11	Desille-Gbaguidi H, Hebert T, Paternotte-Villemagne J, Gaborit C, Rush E, Body G et al. Overall care cost comparison between robotic and laparoscopic surgery for endometrial and cervical cancer. Eur J Obstet Gynecol Reprod Biol 2013; 171(2):348-352.
12	ElSahwi KS, Hooper C, De Leon MC, Gallo TN, Ratner E, Silasi DA et al. Comparison between 155 cases of robotic vs. 150 cases of open surgical staging for endometrial cancer. Gynecol Oncol 2012; 124(2):260-264.

No	선택 문헌
13	Escobar PF, Frumovitz M, Soliman PT, Frasure HE, Fader AN, Schmeler KM et al. Comparison of single-port laparoscopy, standard laparoscopy, and robotic surgery in patients with endometrial cancer. Ann Surg Oncol 2012; 19(5):1583-1588.
14	Estape R, Lambrou N, Diaz R, Estape E, Dunkin N, Rivera A. A case matched analysis of robotic radical hysterectomy with lymphadenectomy compared with laparoscopy and laparotomy. Gynecol Oncol. 2009 Jun;113(3):357-61.
15	Estape R, Lambrou N, Estape E, et al. Roboticc-assisted total laparoscopic hysterectomy and staging for the treatment of endometrial cancer: a comparison with conventional laparoscopy and abdominal approaches. Journal of Robotic Surgery, 2011; 6:199-205
16	Gehrig PA, Cantrell LA, Shafer A, Abaid LN, Mendivil A, Boggess JF et al. What is the optimal minimally invasive surgical procedure for endometrial cancer staging in the obese and morbidly obese woman? Gynecol Oncol 2008; 111(1):41-45.
17	Geisler JP, Orr CJ, Khurshid N, Phibbs G, Manahan KJ, Geisler JP et al. Robotically assisted laparoscopic radical hysterectomy compared with open radical hysterectomy. Int J Gynecol Cancer 2010; 20(3):438-442.
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19	Gocmen A, Sanlikan F, Ucar MG, Gocmen A, Sanlikan F, Ucar MG. Comparison of robotic-assisted surgery outcomes with laparotomy for endometrial cancer staging in Turkey. Arch Gynecol Obstet 2010; 282(5):539-545.
20	Gocmen A,Sanlikan F, Ucar MG. Comparion of outcomes between laparotomy and robotic technique for cerviccal cancer. Journal of Robotic Surgery, 2010;4:123-128
21	Gortchev GT. Robot-assisted radical hysterectomy-perioperative and survival outcomes in patients with cervical cancer compared to laparoscopic and open radical surgery. Gynecological Surgery 2012; 9(1):81-88.
22	Halliday D, Lau S, Vaknin Z et al. Robotic radical hysrterectomy: Comparison of outcomes and cost. Journal of Robotic Surgery. 2010;4:211-216
23	Hoekstra AV, Jairam-Thodla A, Rademaker A, Singh DK, Buttin BM, Lurain JR et al. The impact of robotics on practice management of endometrial cancer: transitioning from traditional surgery. Int J Med Robot 2009; 5(4):392-397.
24	Holtz DO, Miroshnichenko G, Finnegan MO, et al. Endometrial cancer surgery costs: robot vs laparoscopy. J Minim Invasive Gynecol, 2010; 500-503
25	Jung YW, Lee DW, Kim SW, Nam EJ, Kim JH, Kim JW et al. Robot-assisted staging using three robotic arms for endometrial cancer: comparison to laparoscopy and laparotomy at a single institution. J Surg Oncol 2010; 101(2):116-121.
26	Ko EM, Muto MG, Berkowitz RS, Feltmate CM, Ko EM, Muto MG et al. Robotic versus open radical hysterectomy: a comparative study at a single institution. Gynecol Oncol 2008; 111(3):425-430.
27	Leitao MM, Jr., Malhotra V, Briscoe G, Suidan R, Dholakiya P, Santos K et al. Postoperative pain medication requirements in patients undergoing computer-assisted ("Robotic") and standard laparoscopic procedures for newly diagnosed endometrial cancer. Ann Surg Oncol

No	선택 문헌
	2013; 20(11):3561-3567.
28	Lim PC, Kang E, Park dH, Lim PC, Kang E, Park DH. A comparative detail analysis of the learning curve and surgical outcome for robotic hysterectomy with lymphadenectomy versus laparoscopic hysterectomy with lymphadenectomy in treatment of endometrial cancer: a case-matched controlled study of the first one hundred twenty two patients. Gynecol Oncol 2011; 120(3):413-418.
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30	Lowe MP, Hoekstra AV, Jairam-Thodla A, et al. A comparison of robot-assisted and traditioal radical hysterectomy for early-stage cervical cancer. Journal of Robotic Surgery, 2009;3:19-23.
31	Maggioni A, Minig L, Zanagnolo V, Peiretti M, Sanguineti F, Bocciolone L et al. Robotic approach for cervical cancer: comparison with laparotomy: a case control study. Gynecol Oncol 2009; 115(1):60-64.
32	Magrina JF, Zanagnolo V, Giles D, Noble BN, Kho RM, Magtibay PM et al. Robotic surgery for endometrial cancer: comparison of perioperative outcomes and recurrence with laparoscopy, vaginal/laparoscopy and laparotomy. Eur J Gynaecol Oncol 2011; 32(5):476-480.
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34	Mok ZW, Yong EL, Low JJ, Ng JS, Mok ZW, Yong EL et al. Clinical outcomes in endometrial cancer care when the standard of care shifts from open surgery to robotics. Int J Gynecol Cancer 2012; 22(5):819-825.
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6.3. 문헌배제사유 및 배제문헌목록

① 자궁암 대상이 아닌 문헌
② 로봇도움하 복강경 자궁적출술이 대상이 아닌 문헌
③ 개복수술이나 복강경수술과 비교 분석되지 않은 연구
④ 적절한 결과변수가 보고되지 않은 경우
⑤ 동물실험 및 전임상시험 연구
⑥ 무작위비교임상시험이나 비무작위임상연구가 아닌 연구
⑦ 원저가 아닌 연구
⑧ 초록만 발표된 연구
⑨ 동료심사를 거쳐 학술지에 게재된 연구가 아닌 문헌
⑩ 한국어, 영어로 출판되지 않은 문헌
⑪ 중복 출판 문헌
⑫ 원문 확보 불가 문헌

연번	배 제 문 헌	배제 사유
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	hysterectomy cases. The future is now? Int J Med Robot 2007; 3(3):224-228.	
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6.4. 개별합병증 Forest plot

가. 로봇수술 vs 개복수술: 자궁내막암

1) 비뇨생식기계 손상

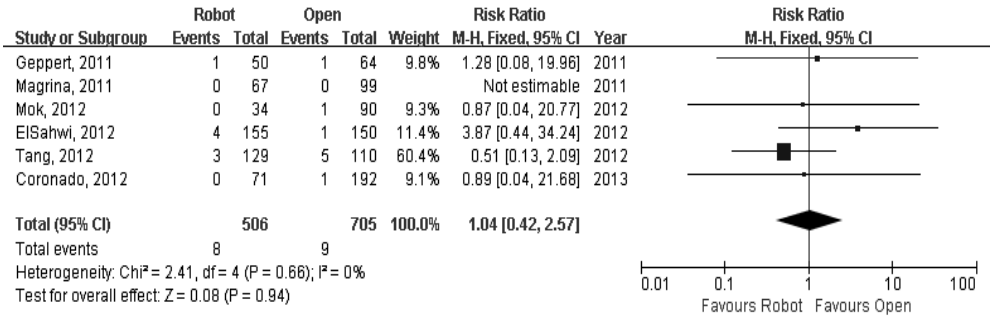


그림 50. [자궁내막암] 비뇨생식기계 손상: 로봇수술 vs 개복수술

2) 위장관계 손상

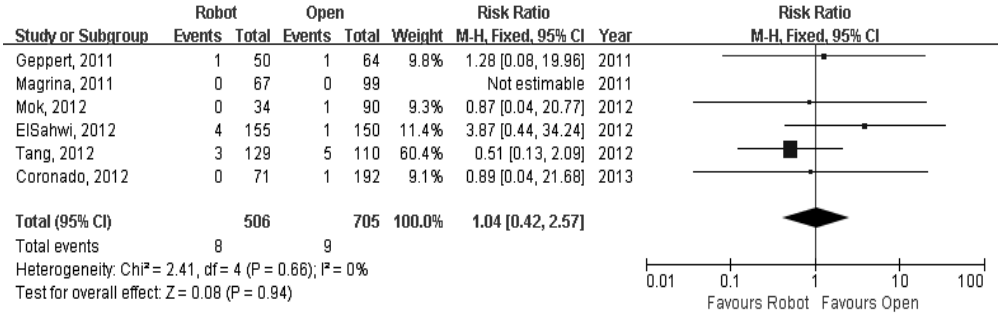


그림 51. [자궁내막암] 위장관계 손상: 로봇수술 vs 개복수술

3) 신경손상

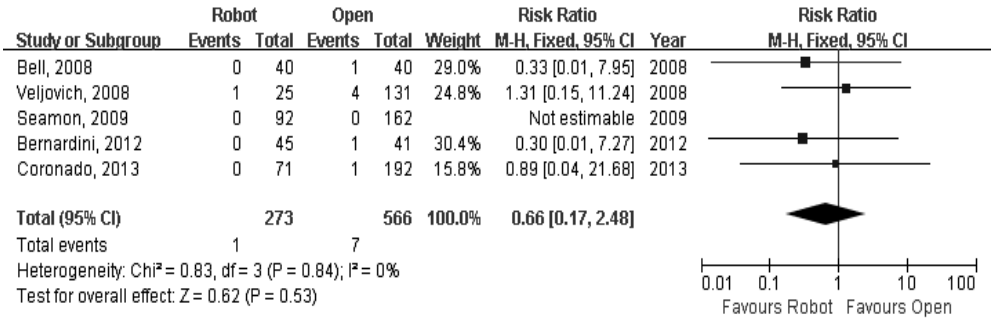


그림 52. [자궁내막암] 신경손상: 로봇수술 vs 개복수술

4) 혈관손상

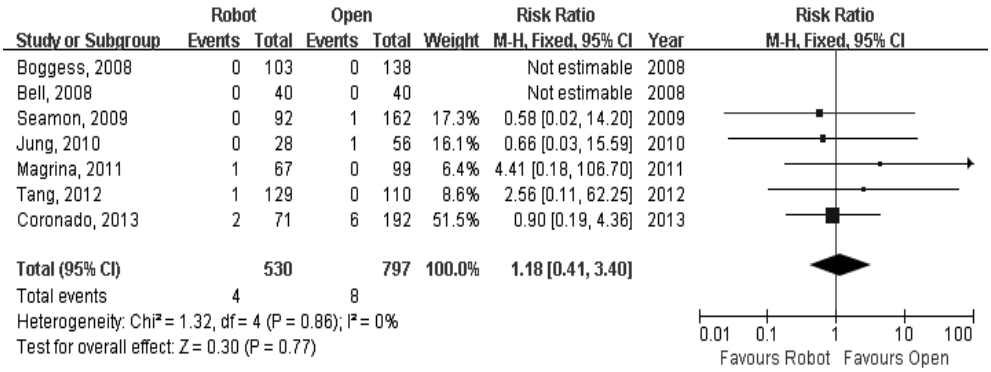


그림 53. [자궁내막암] 혈관 손상: 로봇수술 vs 개복수술

5) 방광절개

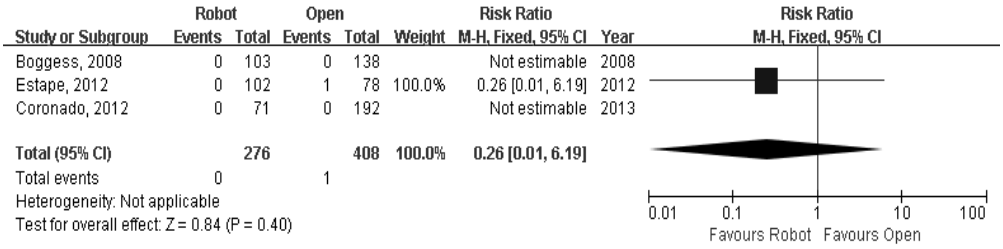


그림 54. [자궁내막암] 방광절개: 로봇수술 vs 개복수술

6) 장절개

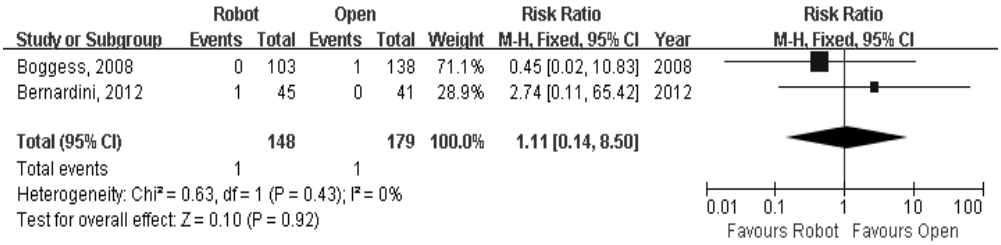


그림 55. [자궁내막암] 장절개: 로봇수술 vs 개복수술

7) 질 열상

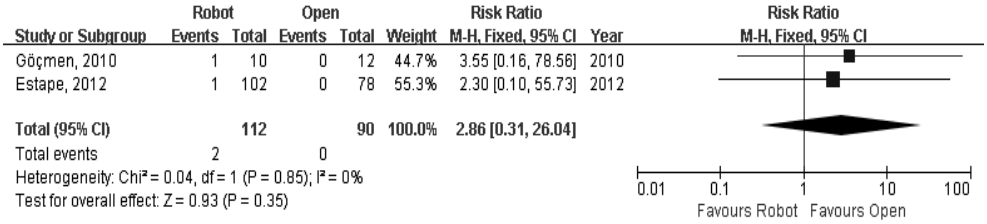
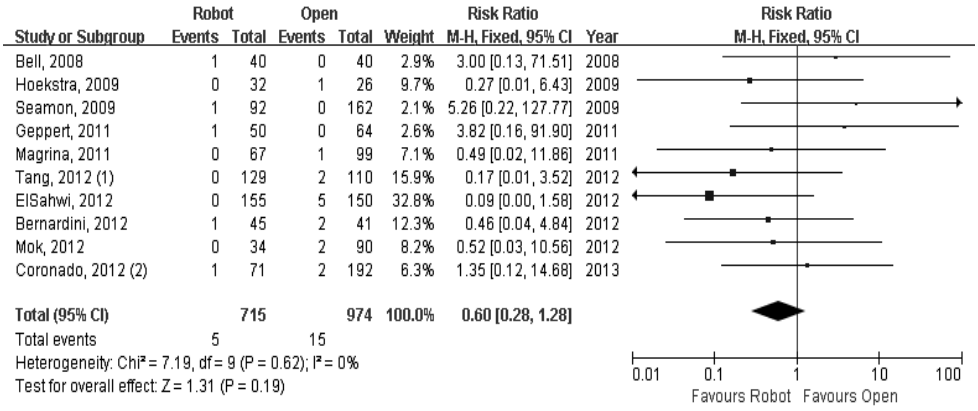


그림 56. [자궁내막암] 질 열상: 로봇수술 vs 개복수술

8) 수술중/후 출혈



Footnotes
(1) 복강내 출혈
(2) 복강내 출혈

그림 57. [자궁내막암] 수술중/후 출혈: 로봇수술 vs 개복수술

9) 질부위 합병증(구개 열개 및 열상 이외)

Study or Subgroup	Robot Events	Robot Total	Open Events	Open Total	Weight	Risk Ratio M-H, Fixed, 95% CI	Year
Bell, 2008	0	40	1	40	20.8%	0.33 [0.01, 7.95]	2008
Boggess, 2008	1	103	2	138	23.7%	0.67 [0.06, 7.29]	2008
Veljovich, 2008	1	25	0	131	2.3%	15.23 [0.64, 363.64]	2008
Estape, 2009	1	102	0	78	7.8%	2.30 [0.10, 55.73]	2009
Geppert, 2011	0	50	2	64	30.5%	0.25 [0.01, 5.19]	2011
Tang, 2012	4	129	0	110	7.5%	7.68 [0.42, 141.17]	2012
Coronado, 2013	3	71	1	192	7.5%	8.11 [0.86, 76.72]	2013
Total (95% CI)		**520**		**753**	**100.0%**	**2.01 [0.88, 4.62]**	
Total events	10		6				

Heterogeneity: Chi² = 7.72, df = 6 (P = 0.26); I² = 22%
Test for overall effect: Z = 1.65 (P = 0.10)

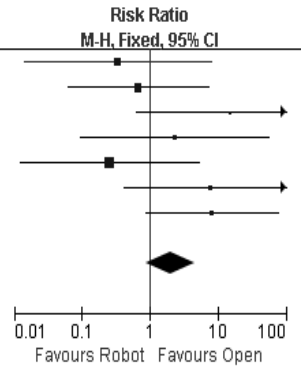
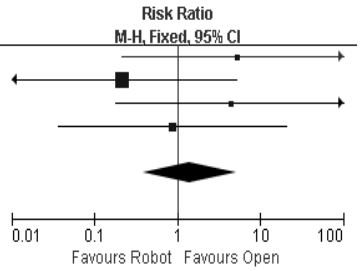


그림 58. [자궁내막암] 질부위 합병증: 로봇수술 vs 개복수술

10) 누공

Study or Subgroup	Robot Events	Robot Total	Open Events	Open Total	Weight	Risk Ratio M-H, Fixed, 95% CI	Year
Seamon, 2009 (1)	1	92	0	162	10.6%	5.26 [0.22, 127.77]	2009
Lim, 2010 (2)	0	56	1	36	53.2%	0.22 [0.01, 5.17]	2010
Magrina, 2011 (3)	1	67	0	99	11.8%	4.41 [0.18, 106.70]	2011
Mok, 2012 (4)	0	34	1	90	24.4%	0.87 [0.04, 20.77]	2012
Total (95% CI)		**249**		**387**	**100.0%**	**1.41 [0.38, 5.15]**	
Total events	2		2				

Heterogeneity: Chi² = 2.58, df = 3 (P = 0.46); I² = 0%
Test for overall effect: Z = 0.52 (P = 0.61)



Footnotes
(1) 누공
(2) 장질누공
(3) 방광누공
(4) 요관누공

그림 59. [자궁내막암] 누공: 로봇수술 vs 개복수술

11) 림프부종

Study or Subgroup	Robot Events	Robot Total	Open Events	Open Total	Weight	Risk Ratio M-H, Fixed, 95% CI	Year
Boggess, 2008	1	103	0	138	10.9%	4.01 [0.17, 97.44]	2008
Bell, 2008	0	40	2	40	63.5%	0.20 [0.01, 4.04]	2008
Jung, 2010	0	28	1	56	25.7%	0.66 [0.03, 15.59]	2010
Total (95% CI)		**171**		**234**	**100.0%**	**0.73 [0.16, 3.27]**	
Total events	1		3				

Heterogeneity: Chi² = 1.81, df = 2 (P = 0.40); I² = 0%
Test for overall effect: Z = 0.41 (P = 0.68)

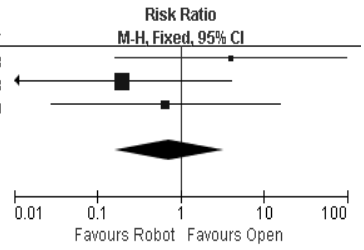


그림 60. [자궁내막암] 림프부종: 로봇수술 vs 개복수술

12) 림프낭종 (lymphocele)

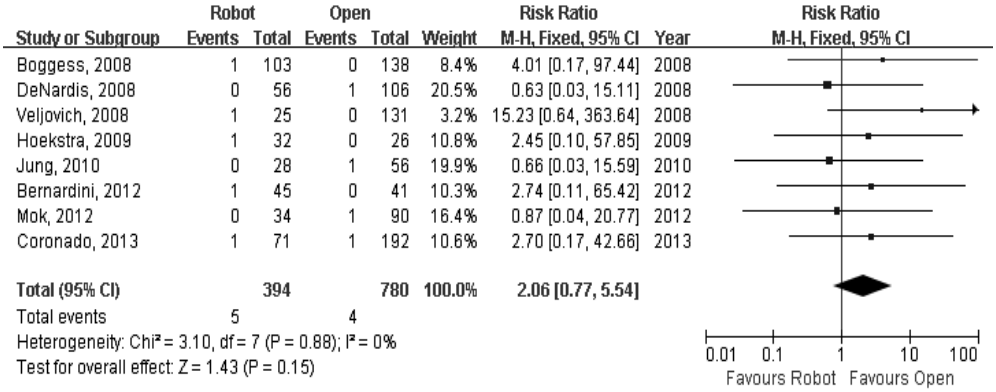


그림 61. [자궁내막암] 림프낭종: 로봇수술 vs 개복수술

13) 색혈전증

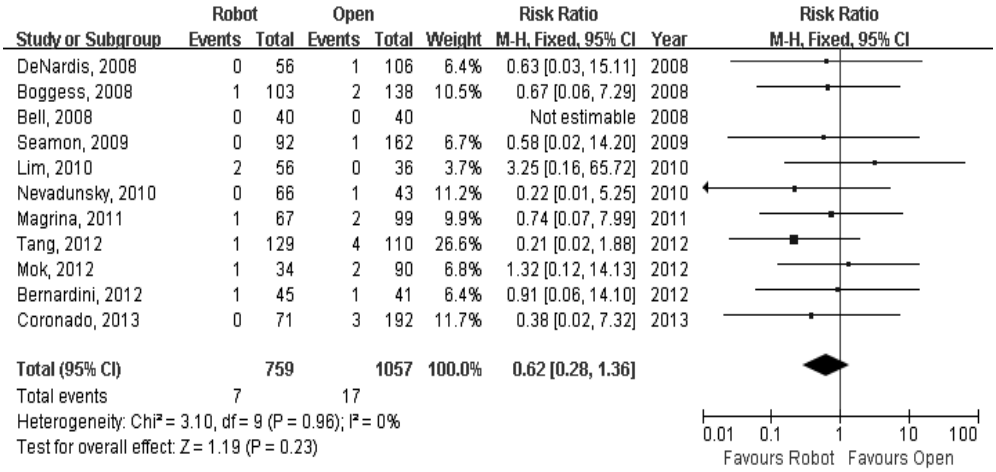


그림 62. [자궁내막암] 색혈전증: 로봇수술 vs 개복수술

14) 뇌졸중

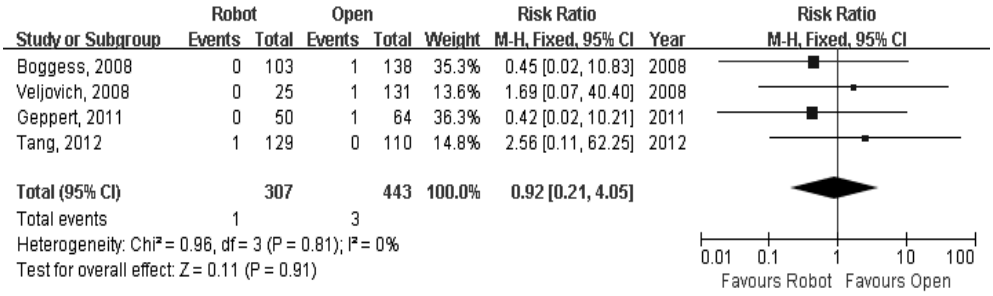


그림 63. [자궁내막암] 뇌졸중: 로봇수술 vs 개복수술

15) 요정체

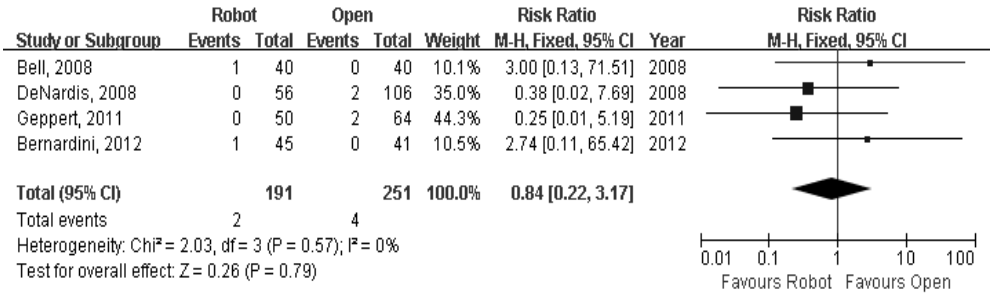


그림 64. [자궁내막암] 요정체: 로봇수술 vs 개복수술

16) 요관협착/요관폐쇄

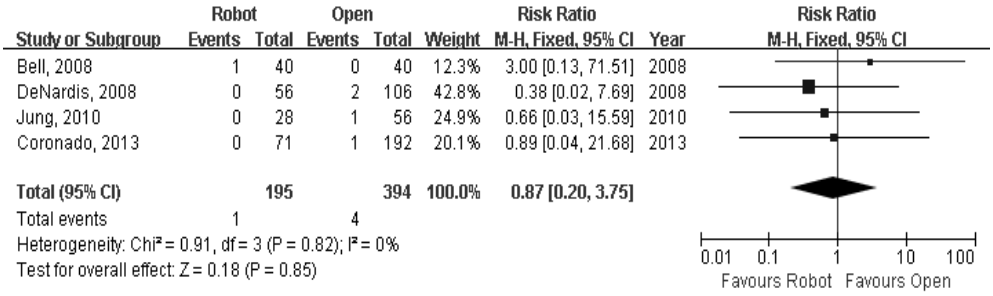


그림 65. [자궁내막암] 요관협착/요관폐쇄: 로봇수술 vs 개복수술

17) 요로감염

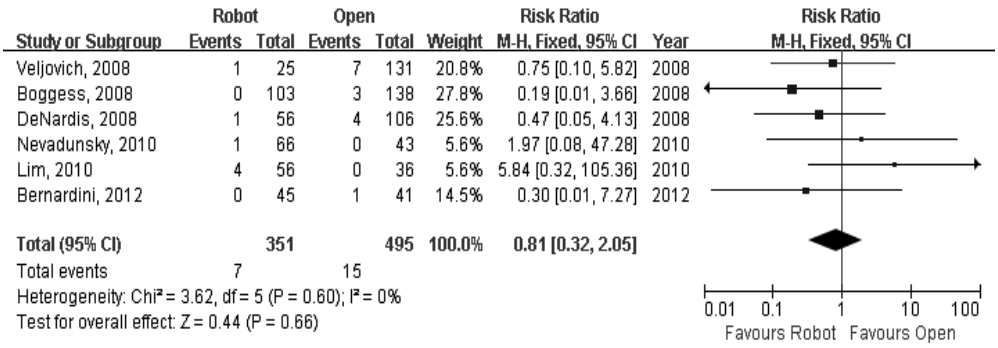


그림 66. [자궁내막암] 요로감염: 로봇수술 vs 개복수술

18) 급성 신부전/세뇨관 괴사

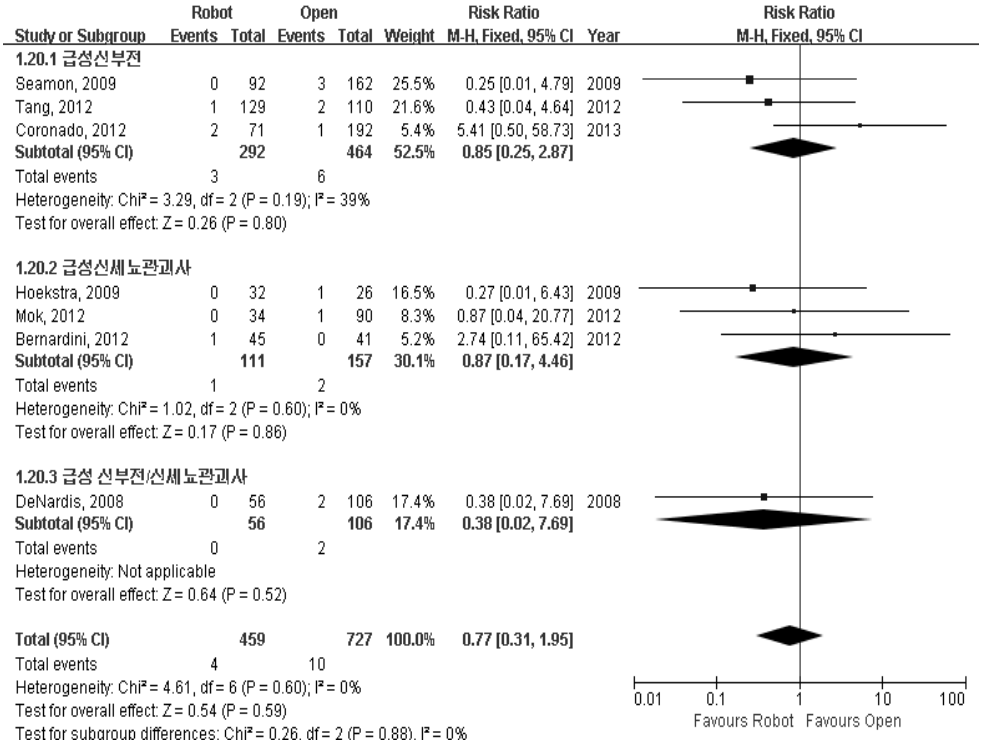


그림 67. [자궁내막암] 급성신부전/세뇨관 괴사: 로봇수술 vs 개복수술

19) 농양

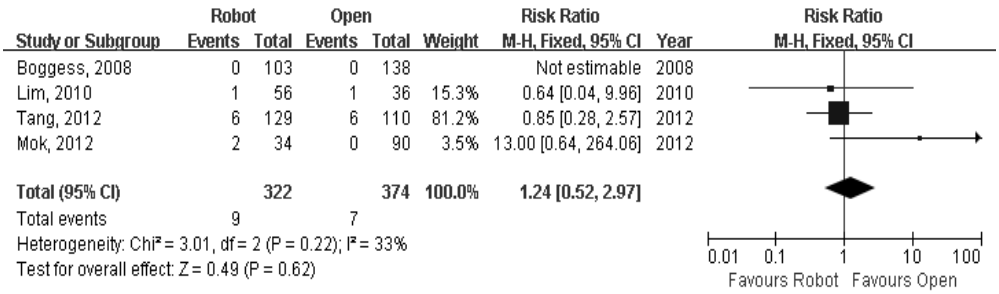


그림 68. [자궁내막암] 농양: 로봇수술 vs 개복수술

20) 탈장

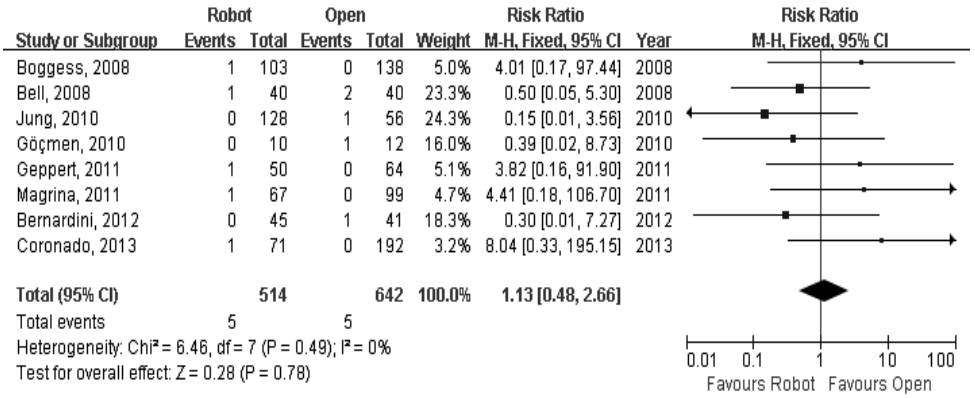


그림 69. [자궁내막암] 탈장: 로봇수술 vs 개복수술

21) 폐렴

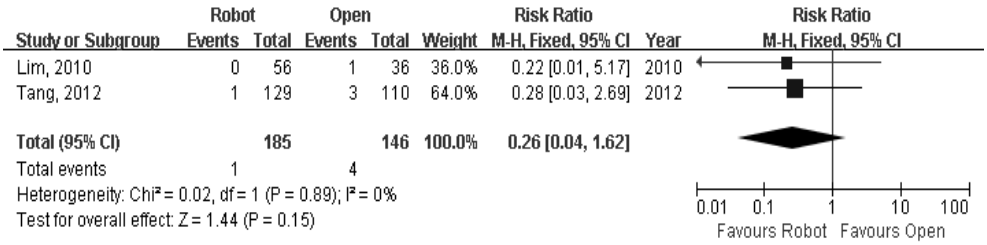


그림 70. [자궁내막암] 폐렴: 로봇수술 vs 개복수술

22) 폐부종

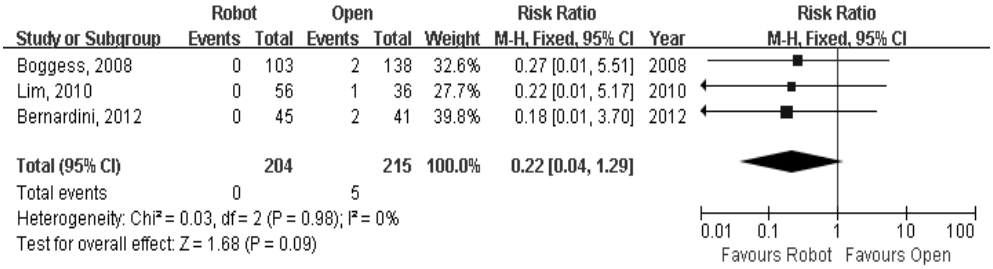


그림 71. 그림 [자궁내막암] 폐부종: 로봇수술 vs 개복수술

23) 호흡부전/재인공호흡

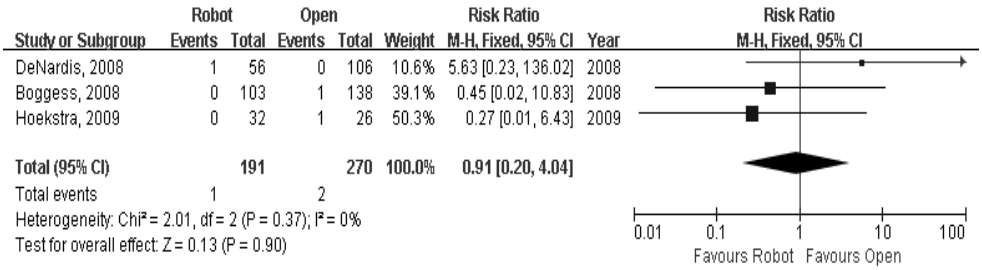


그림 72. 그림 [자궁내막암] 호흡부전/재인공호흡: 로봇수술 vs 개복수술

24) 패혈증

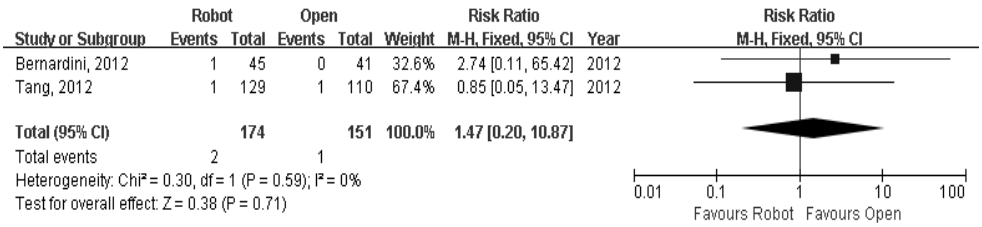


그림 73. [자궁내막암] 패혈증: 로봇수술 vs 개복수술

25) 봉와직염(cellulitis)

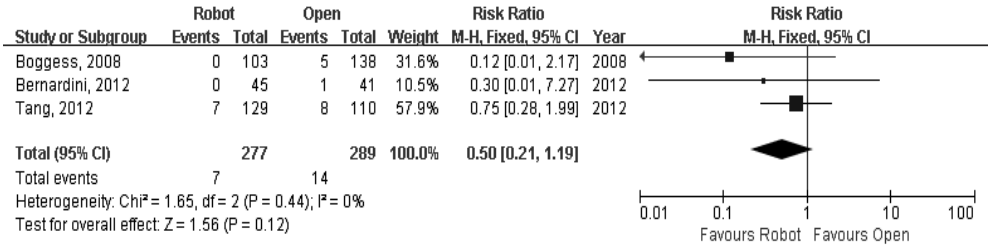


그림 74. [자궁내막암] 봉와직염: 로봇수술 vs 개복수술

26) 유출 및 배액

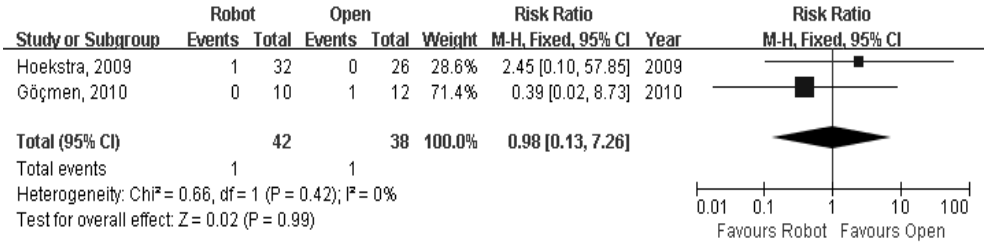


그림 75. [자궁내막암] 유출 및 배액: 로봇수술 vs 개복수술

27) 심방세동

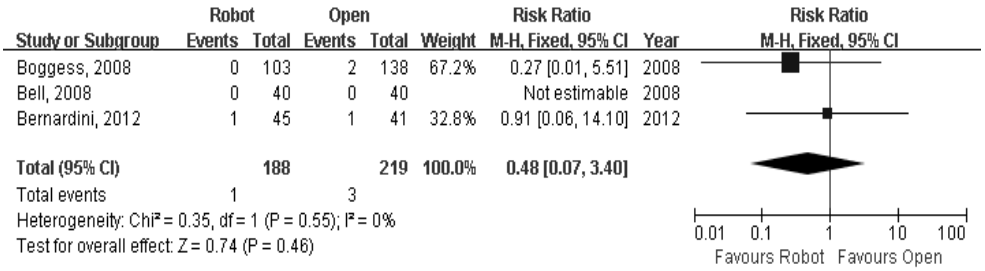


그림 76. [자궁내막암] 심방세동: 로봇수술 vs 개복수술

나. 로봇수술 vs 개복수술: 자궁경부암

1) 방광손상

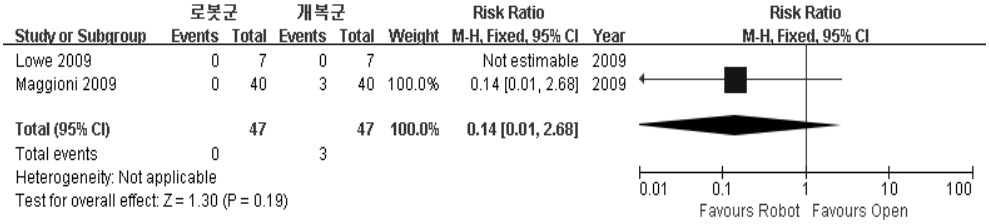


그림 77. [자궁경부암] 방광손상: 로봇수술 vs 개복수술

2) 요관손상

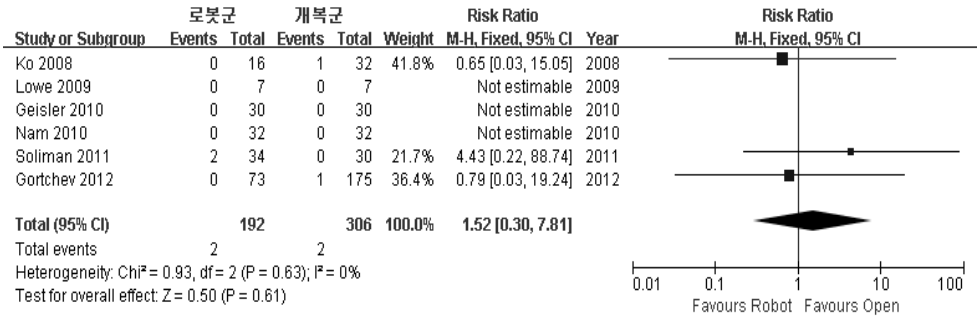


그림 78. [자궁경부암] 요관손상: 로봇수술 vs 개복수술

3) 장손상

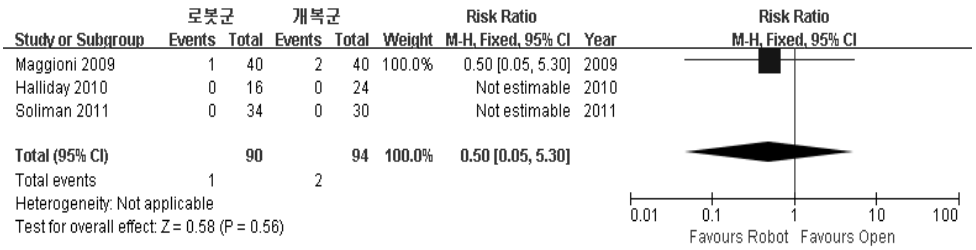


그림 79. [자궁경부암] 장손상: 로봇수술 vs 개복수술

4) 혈관손상

표 68. [자궁경부암] 혈관손상: 로봇수술 vs 개복수술

No	1저자	출판 연도	연구설계	대상질환	N (I/C)	로봇군 % (n/N)	개복군 % (n/N)
1	Soliman	2011	Retrospective cohort	Cervical cancer	64 (34/30)	0% (0/34)	0% (0/30)
2	Geisler	2010	Historical cohort	Cervical cancer	60 (30/30)	0% (0/30)	0% (0/30)
3	Maggioni	2009	Historical cohort	Early stage cervical cancer	80 (40/40)	0% (0/40)	0% (0/40)

5) 신경손상

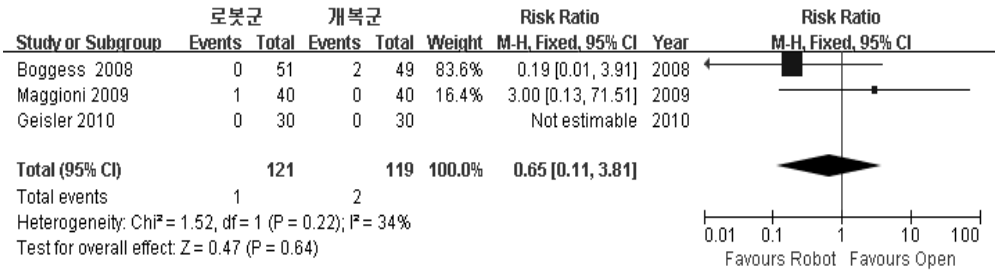


그림 80. [자궁경부암] 신경손상: 로봇수술 vs 개복수술

6) 방광절개

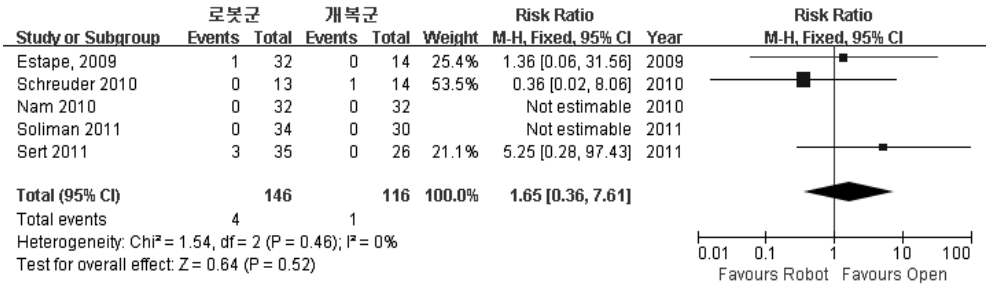


그림 81. [자궁경부암] 방광절개: 로봇수술 vs 개복수술

7) 요관절개

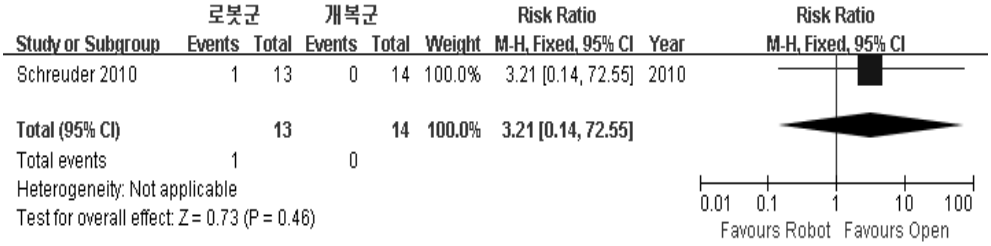


그림 82. [자궁경부암] 요관절개: 로봇수술 vs 개복수술

8) 장절개

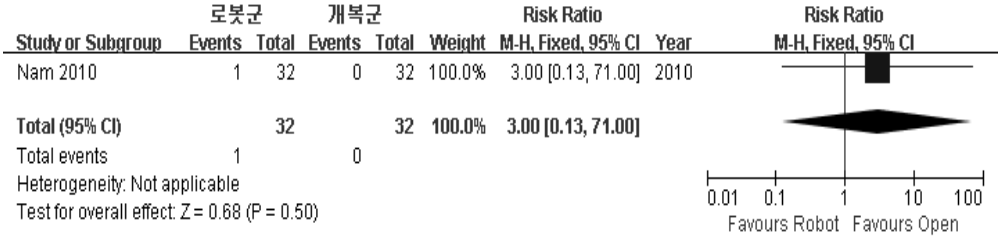


그림 83. [자궁경부암] 장절개: 로봇수술 vs 개복수술

9) 출혈

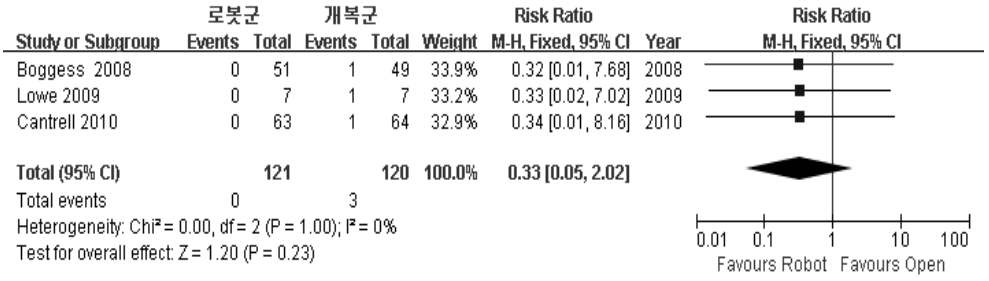


그림 84. [자궁경부암] 출혈: 로봇수술 vs 개복수술

10) 요관질 누공

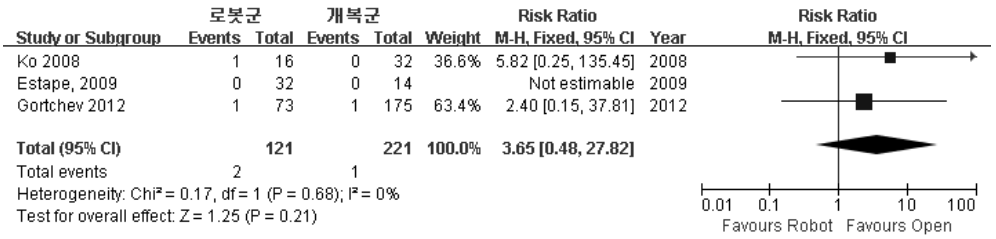


그림 85. [자궁경부암] 요관질 누공: 로봇수술 vs 개복수술

11) 질구개 합병증

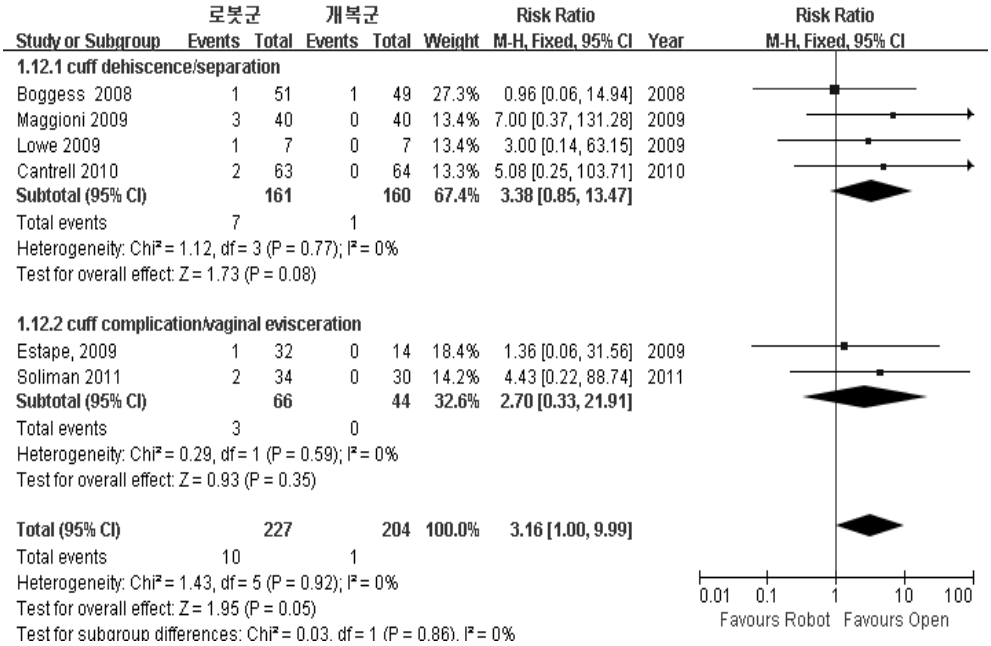


그림 86. [자궁경부암] 질구개 합병증: 로봇수술 vs 개복수술

12) 림프류(lymphocele)

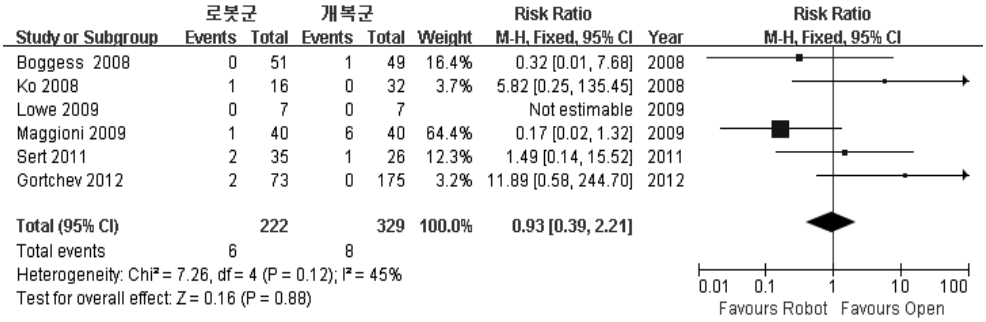


그림 87. [자궁경부암] 림프류: 로봇수술 vs 개복수술

13) 림프부종

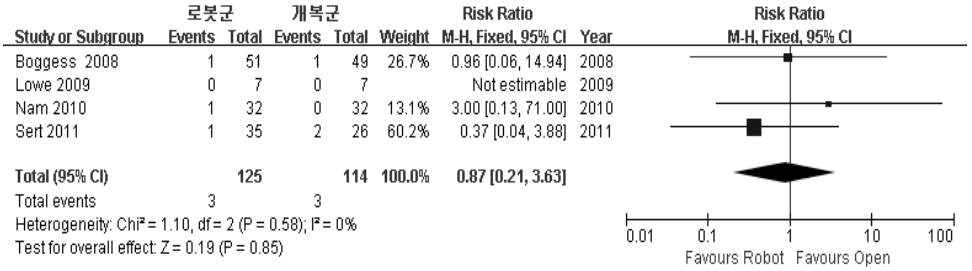


그림 88. [자궁경부암] 림프부종: 로봇수술 vs 개복수술

14) 색혈전증

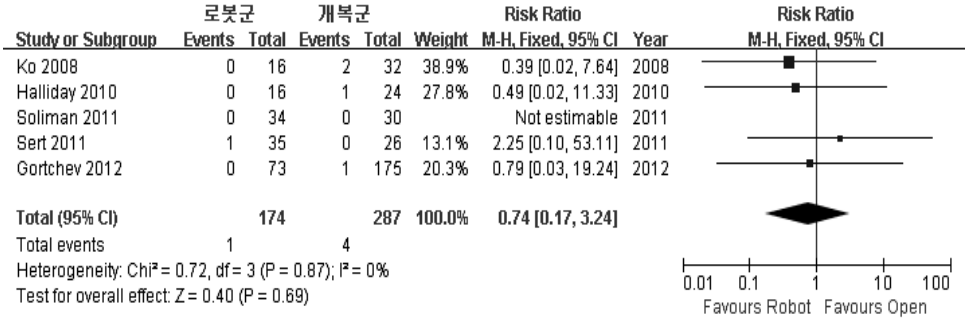
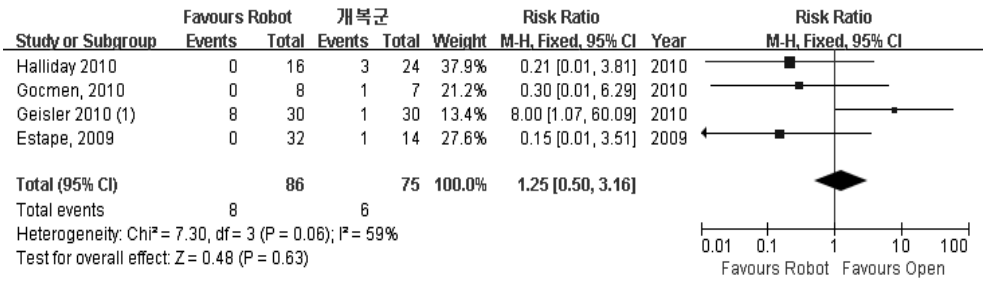


그림 89. [자궁경부암] 색혈전증: 로봇수술 vs 개복수술

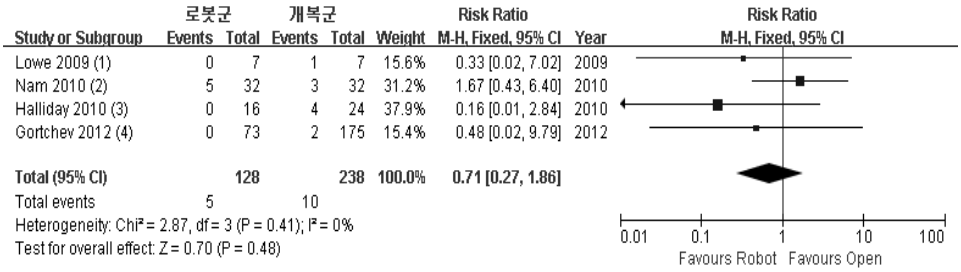
15) 요정체



(1) 수술후 7일째

그림 90. [자궁경부암] 요정체: 로봇수술 vs 개복수술

16) 신부전 및 방광기능부전



Footnotes
(1) 급성신부전
(2) 방광기능부전
(3) 방광기능부전
(4) 수신증

그림 91. [자궁경부암] 신부전 및 방광기능부전: 로봇수술 vs 개복수술

17) 농양

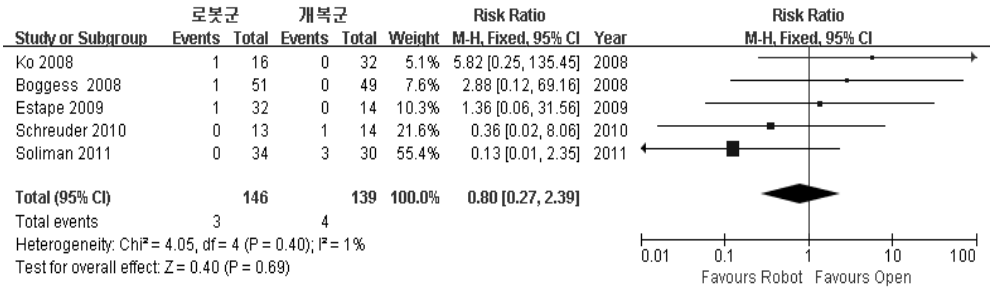


그림 92. [자궁경부암] 농양: 로봇수술 vs 개복수술

18) 장폐색/폐쇄

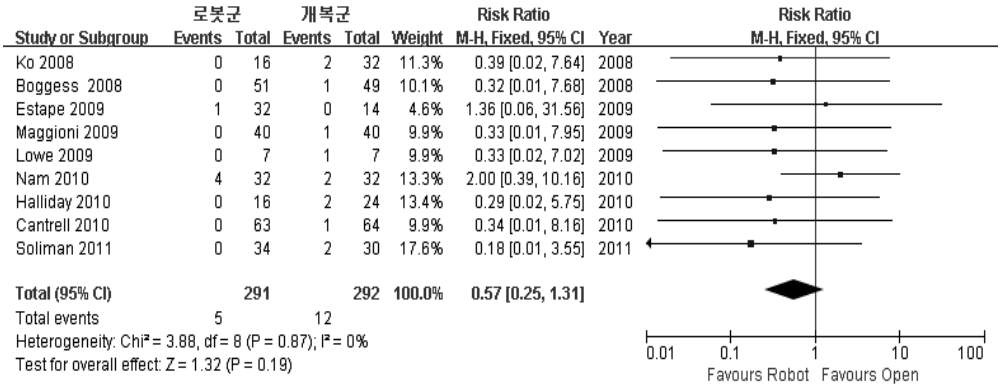


그림 93. [자궁경부암] 장폐색/폐쇄: 로봇수술 vs 개복수술

19) 탈장

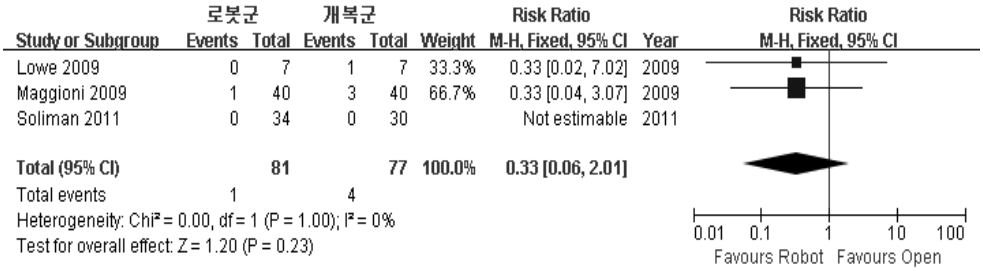
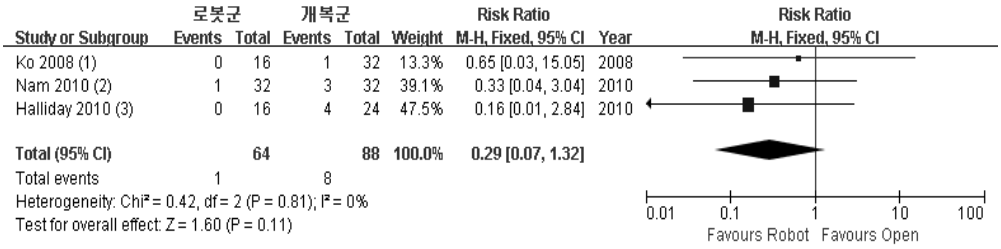


그림 94. [자궁경부암] 탈장: 로봇수술 vs 개복수술

20) 상처 합병증



Footnotes
(1) 상처 열개
(2) 상처 열개
(3) 장액종/혈종

그림 95. [자궁경부암] 상처합병증: 로봇수술 vs 개복수술

21) 봉와직염(cellulitis)

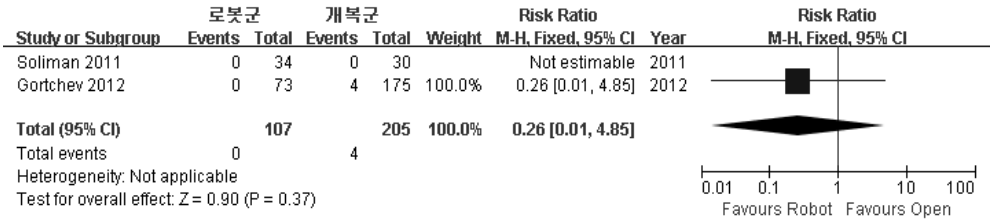


그림 96. [자궁경부암] 봉와직염: 로봇수술 vs 개복수술

22) 폐렴

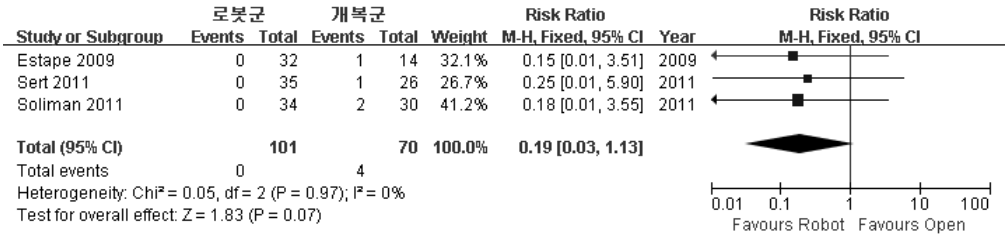


그림 97. [자궁경부암] 폐렴: 로봇수술 vs 개복수술

23) 늑막 삼출

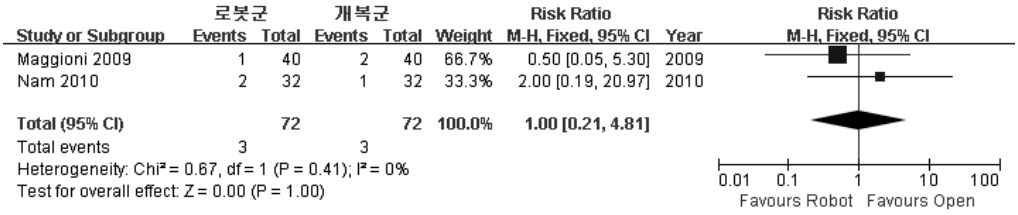


그림 98. [자궁경부암] 늑막삼출: 로봇수술 vs 개복수술

24) 재수술

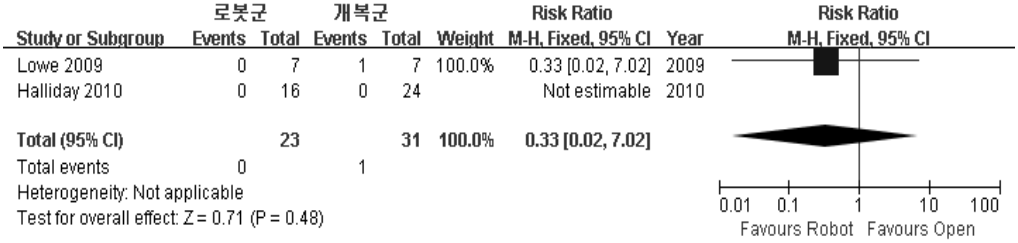


그림 99. [자궁경부암] 재수술: 로봇수술 vs 개복수술

25) 재입원

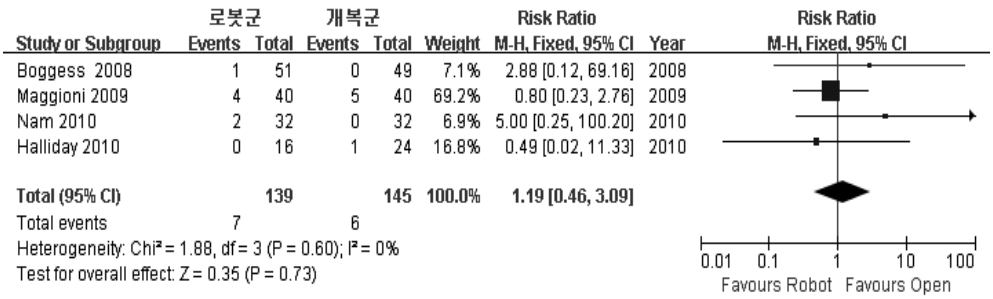


그림 100. [자궁경부암] 재입원: 로봇수술 vs 개복수술

26) 중환자실 입원율

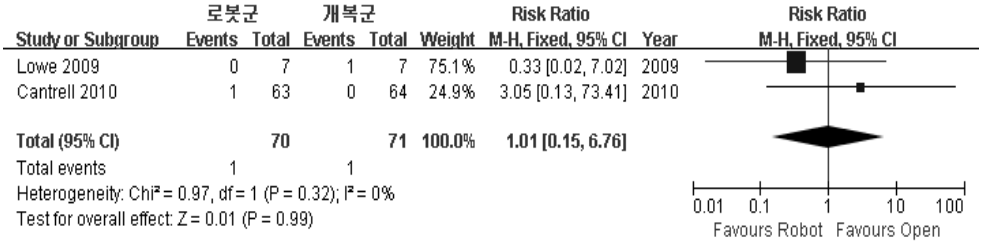
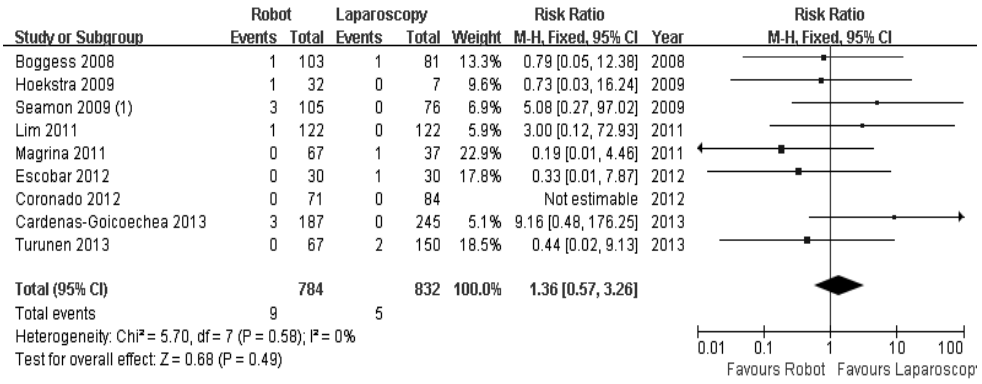


그림 101. [자궁경부암] 중환자실 입원율: 로봇수술 vs 개복수술

다. 로봇수술 vs 복강경수술: 자궁내막암

1) 장 손상(Bowel Injury)



(1) 위장관계 손상

그림 102. [자궁내막암] 장 손상: 로봇수술 vs 복강경수술

2) 혈관 손상(Vascular Injury)

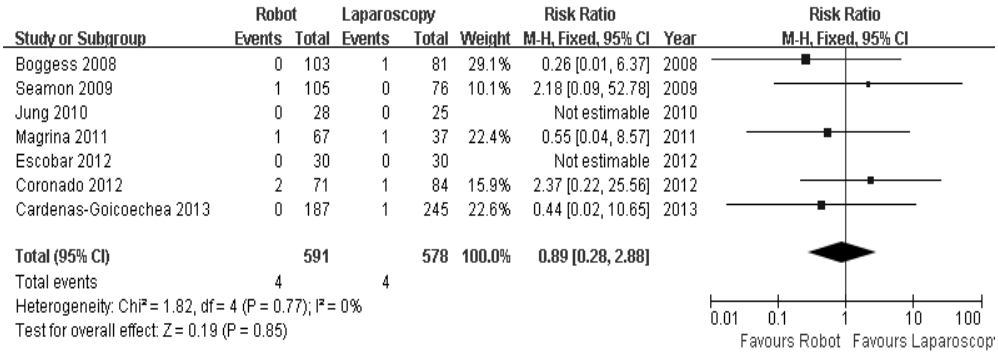


그림 103. [자궁내막암] 혈관 손상: 로봇수술 vs 복강경수술

3) 신경 손상(Nerve Injury)

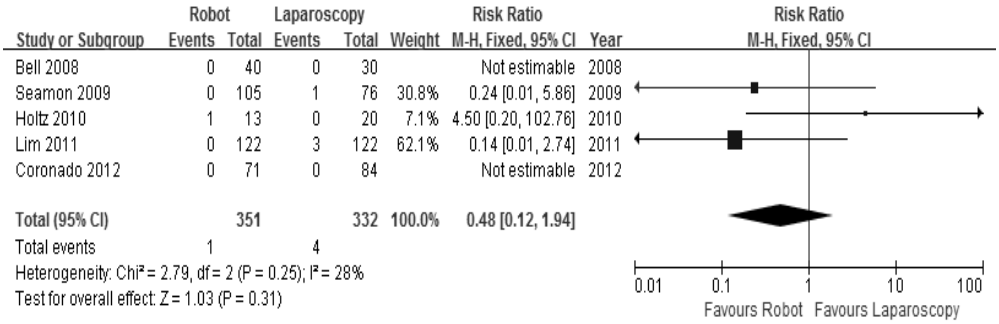


그림 104. [자궁내막암] 신경 손상: 로봇수술 vs 복강경수술

4) 혈관절개(Venotomy)

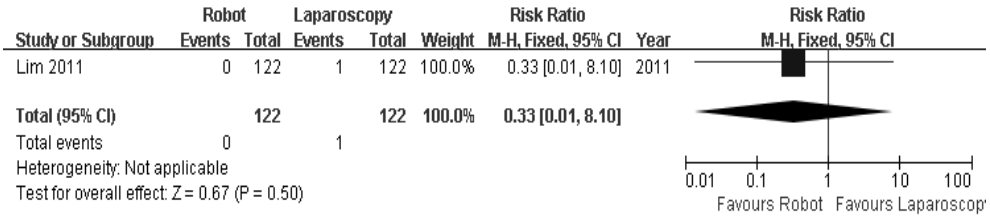


그림 105. [자궁내막암] 혈관절개: 로봇수술 vs 복강경수술

5) 장절개(Enterotomy)

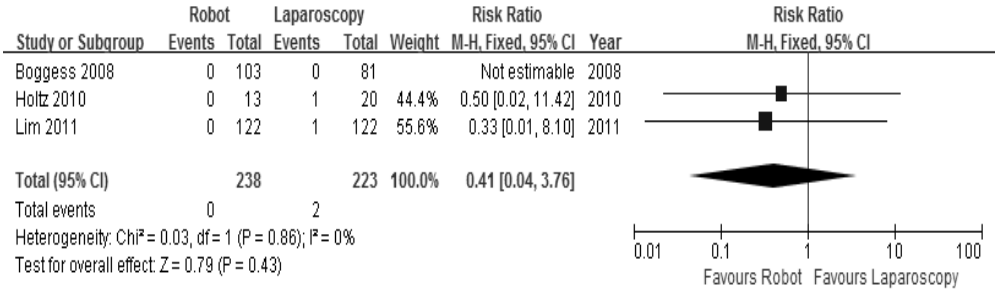


그림 106. [자궁내막암] 장절개: 로봇수술 vs 복강경수술

6) 재수술(reoperation)

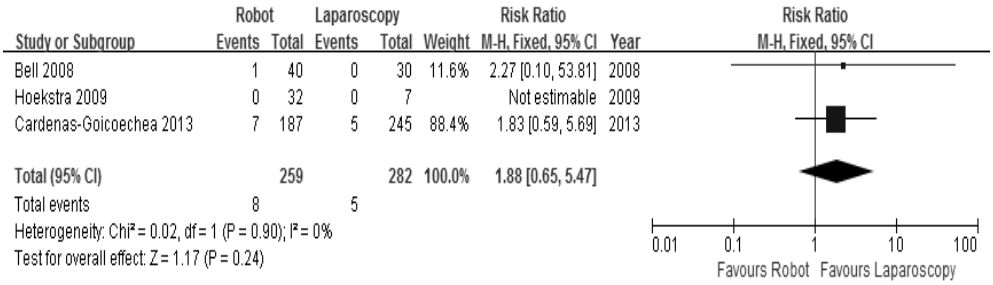


그림 107. [자궁내막암] 재수술: 로봇수술 vs 복강경수술

7) 복강내 출혈(Hemoperitoneum)

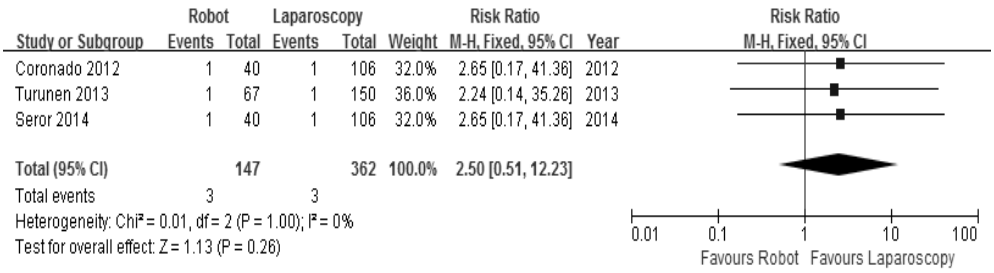


그림 108. [자궁내막암] 복강내 출혈: 로봇수술 vs 복강경수술

8) 질구개 열개(Vaginal Dehiscence)

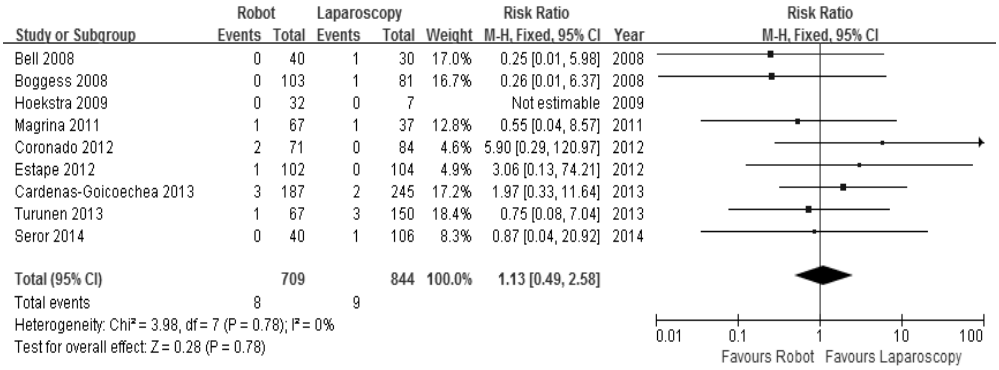


그림 109. [자궁내막암] 질구개 열개: 로봇수술 vs 복강경수술

9) 색혈전증(embolism/thrombosis)

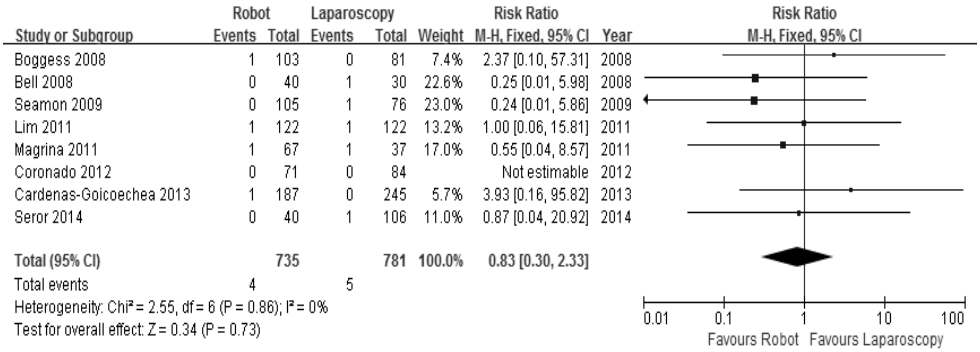


그림 110. [자궁내막암] 색혈전증: 로봇수술 vs 복강경수술

10) 혈종(Hematoma)

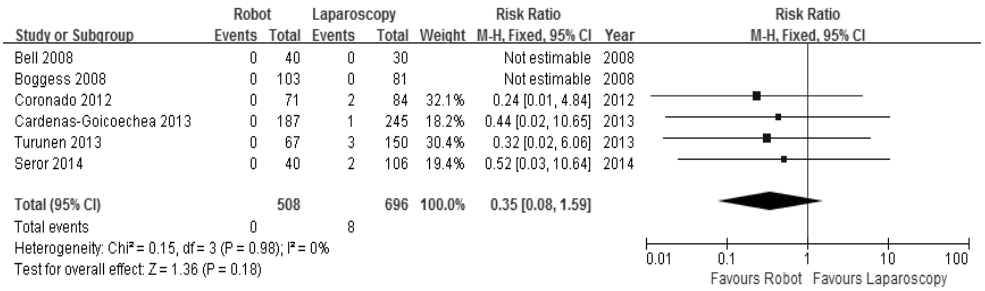
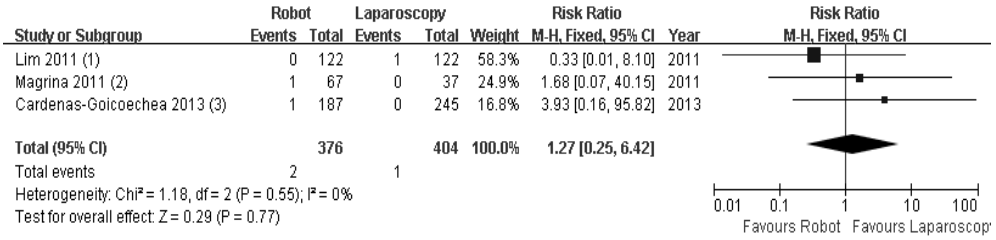


그림 111. [자궁내막암] 혈종: 로봇수술 vs 복강경수술

11) 누공(Fistula)



(1) 방광질 누공
(2) 방광질 누공
(3) 장-피부 누공

그림 112. [자궁내막암] 누공: 로봇수술 vs 복강경수술

12) 탈장(Hernia)

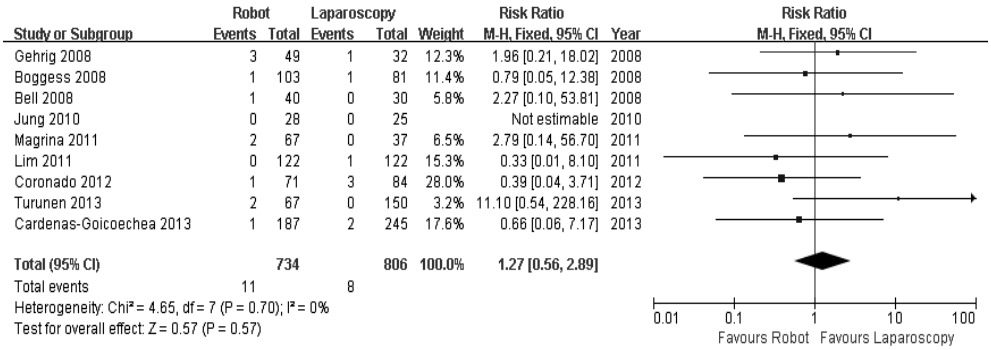


그림 113. [자궁내막암] 탈장: 로봇수술 vs 복강경수술

13) 장폐색/장폐쇄(ileus/bowel obstruction)

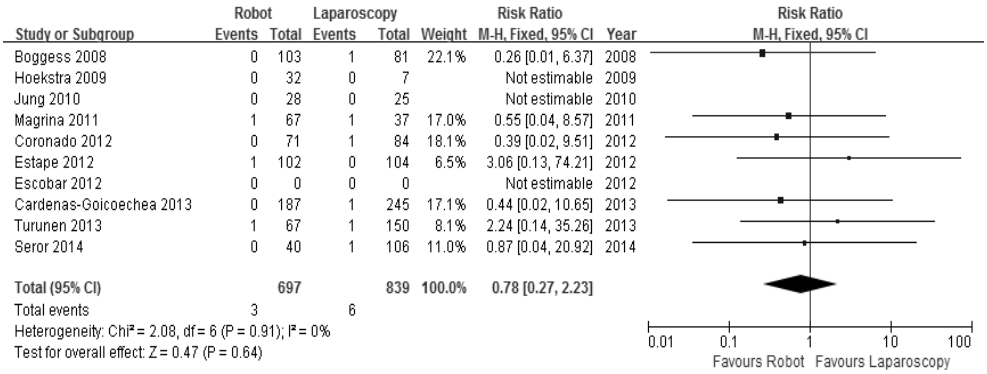


그림 114. [자궁내막암] 장폐색/폐쇄: 로봇수술 vs 복강경수술

14) 봉와직염(Cellulitis)

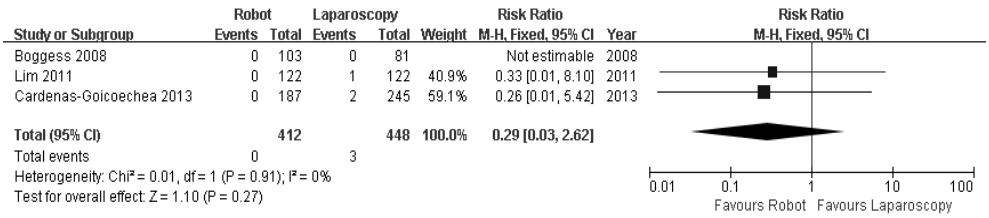


그림 115. [자궁내막암] 봉와직염: 로봇수술 vs 복강경수술

15) 패혈증(Sepsis)

그림 116. [자궁내막암] 패혈증: 로봇수술 vs 복강경수술

16) 농양(Abscess)

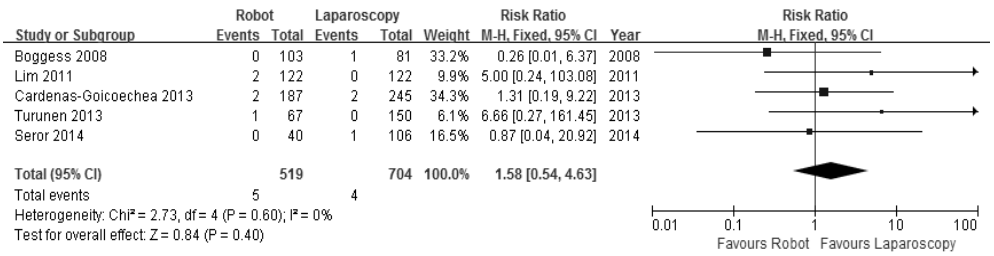


그림 117. [자궁내막암] 농양: 로봇수술 vs 복강경수술

17) 심방세동(Atrial fibrillation)

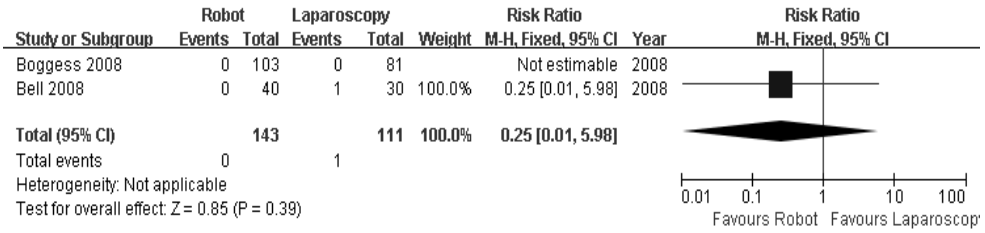
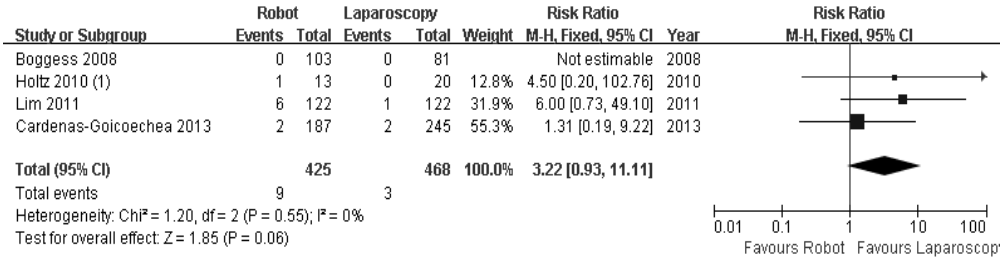


그림 118. [자궁내막암] 심방세동: 로봇수술 vs 복강경수술

18) 상처 분리(Wound separation)

그림 119. [자궁내막암] 상처 분리: 로봇수술 vs 복강경수술

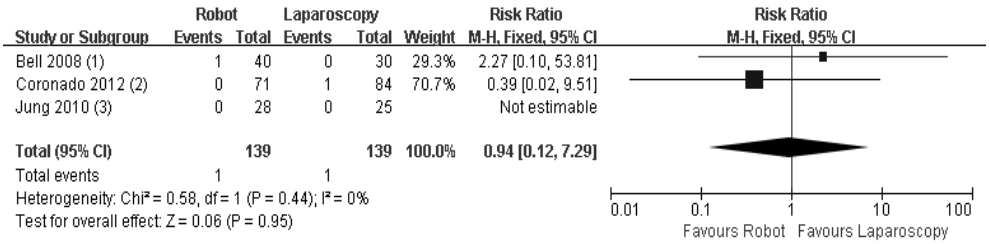
19) 요로감염 및 방광염



(1) 요정체성 방광염

그림 120. [자궁내막암] 요로감염/방광염: 로봇수술 vs 복강경수술

20) 요관 협착 및 폐쇄



Footnotes
(1) 지연성 배뇨
(2) 요관폐쇄
(3) 요관협착

그림 121. [자궁내막암] 요관협착 및 폐쇄: 로봇수술 vs 복강경수술

21) 림프낭종

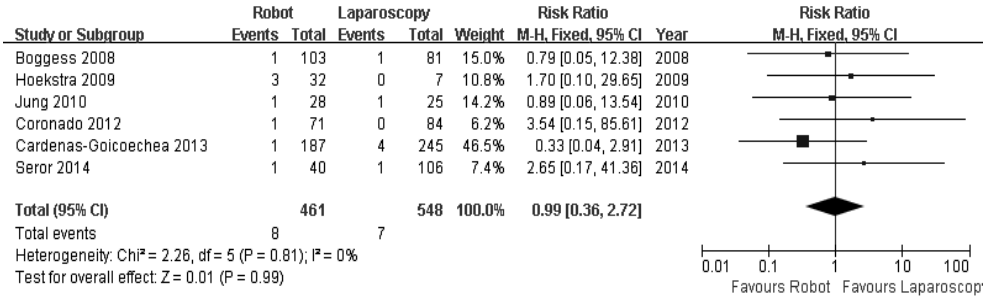


그림 122. [자궁내막암] 림프낭종: 로봇수술 vs 복강경수술

22) 림프부종

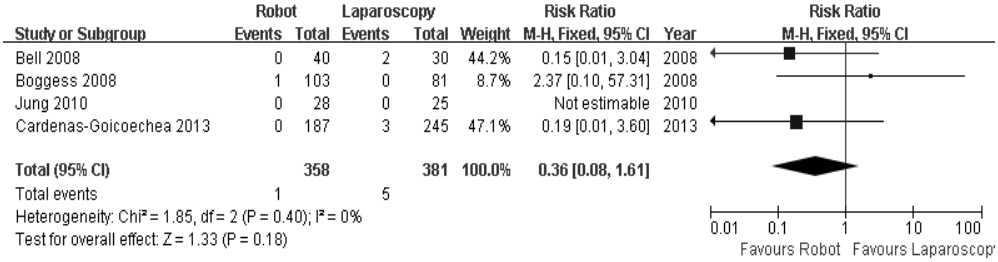
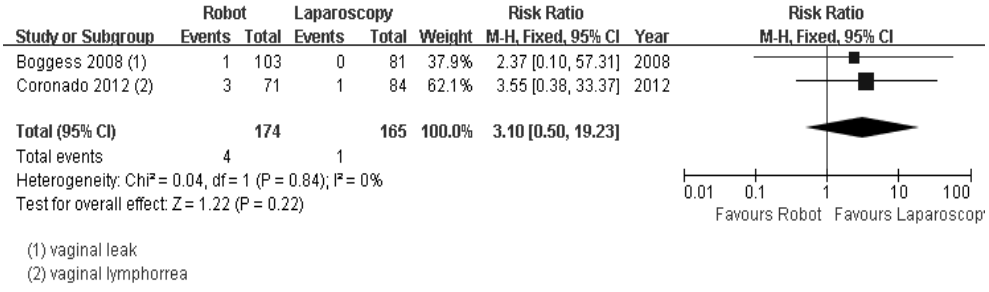


그림 123. [자궁내막암] 림프부종: 로봇수술 vs 복강경수술

23) 질 림프유출



(1) vaginal leak
(2) vaginal lymphorrea

그림 124. [자궁내막암] 질 림프유출: 로봇수술 vs 복강경수술

24) 재입원(Readmission)

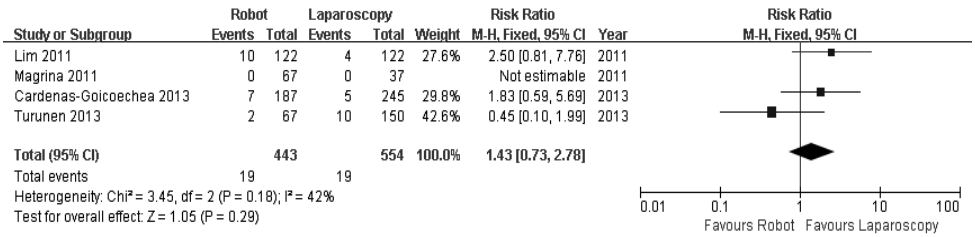


그림 125. [자궁내막암] 재입원: 로봇수술 vs 복강경수술

25) 수혈(Transfusion)

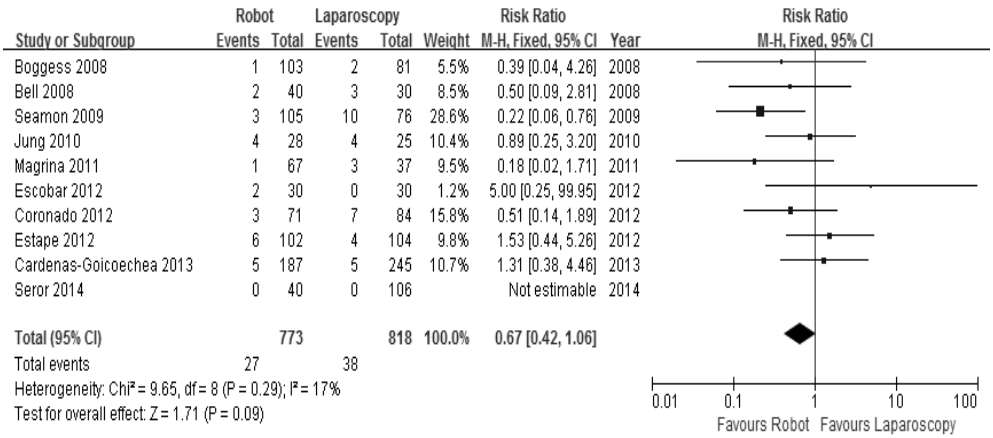


그림 126. [자궁내막암] 수혈: 로봇수술 vs 복강경수술

라. 로봇수술 vs 복강경수술: 자궁경부암

1) 방광절개술(Cystotomy)

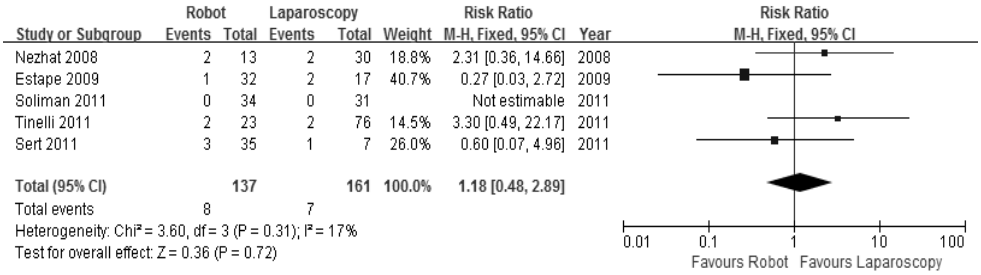


그림 127. [자궁경부암] 방광절개술: 로봇수술 vs 복강경수술

2) 방광손상(Bladder injury)

그림 128. [자궁경부암] 방광손상: 로봇수술 vs 복강경수술

3) 요관손상(Ureteral injury)

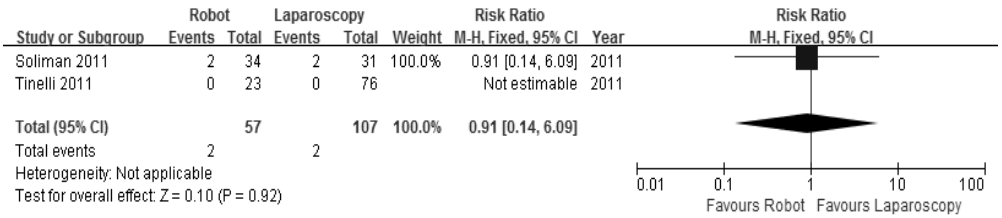


그림 129. [자궁경부암] 요관손상: 로봇수술 vs 복강경수술

4) 혈관손상(Vessel injury)

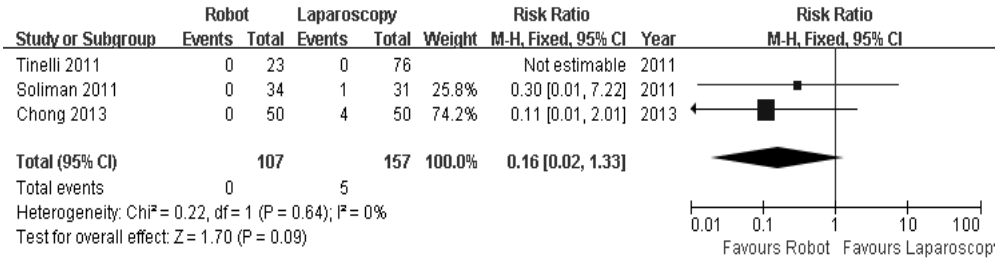
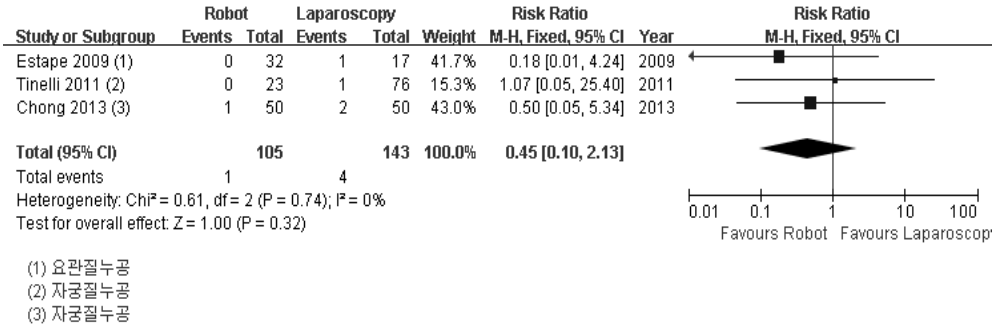


그림 130. [자궁경부암] 혈관손상: 로봇수술 vs 복강경수술

5) 장손상(Bowel injury)

그림 131. [자궁경부암] 장손상: 로봇수술 vs 복강경수술

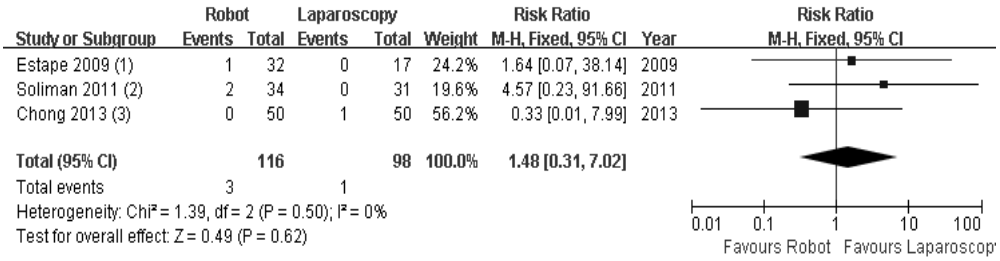
6) 누공(Fistula)



(1) 요관질누공
(2) 자궁질누공
(3) 자궁질누공

그림 132. [자궁경부암] 누공: 로봇수술 vs 복강경수술

7) 질구개 합병증



(1) vaginal evisceration(질 내장탈출증)
(2) cuff complications
(3) cuff dehiscence

그림 133. [자궁경부암] 질구개 합병증: 로봇수술 vs 복강경수술

8) 림프부종(lymphedema)

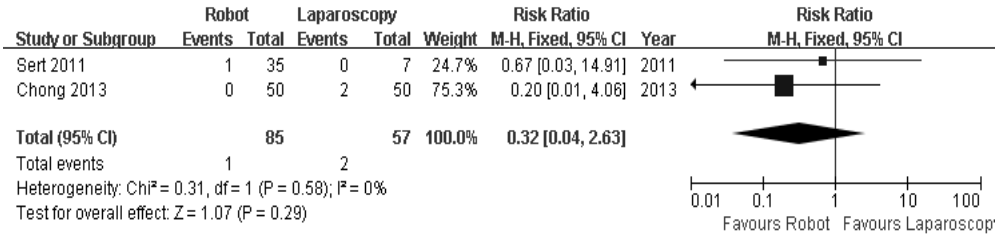


그림 134. [자궁경부암] 림프부종: 로봇수술 vs 복강경수술

9) 림프관련 합병증(림프낭(부)종 외)

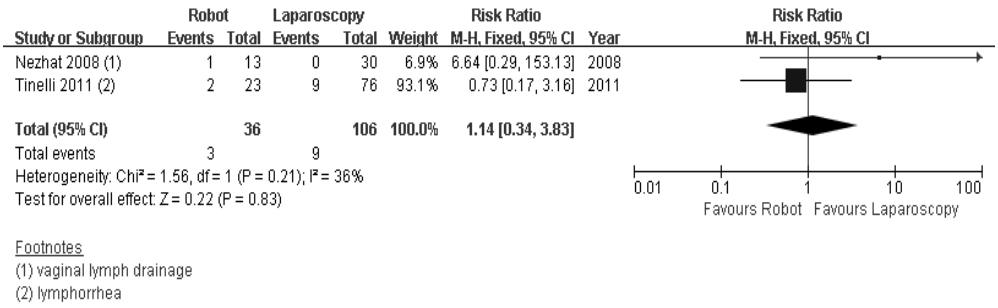


그림 135. [자궁경부암] 림프관련 합병증: 로봇수술 vs 복강경수술

10) 장폐색/폐쇄(ileus/bowel obstruction)

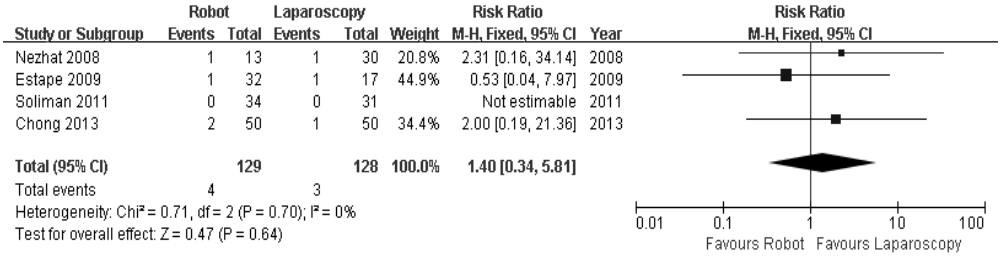


그림 136. [자궁경부암] 장폐색/폐쇄: 로봇수술 vs 복강경수술

11) 탈장(Hernia)

그림 137. [자궁경부암] 탈장: 로봇수술 vs 복강경수술

12) 요정체

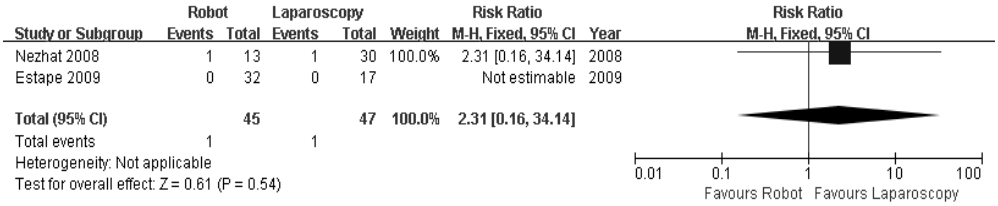


그림 138. [자궁경부암] 요정체: 로봇수술 vs 복강경수술

13) 요로감염

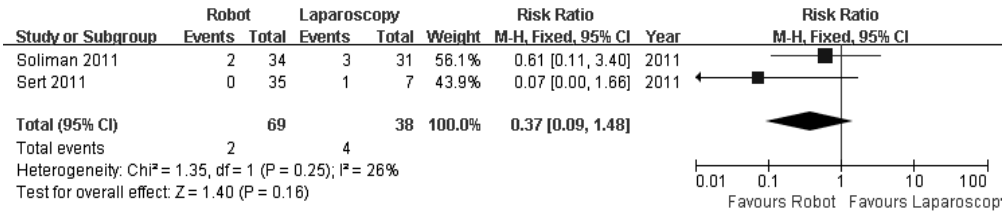


그림 139. [자궁경부암] 요로감염: 로봇수술 vs 복강경수술

14) 농양(Abscess)

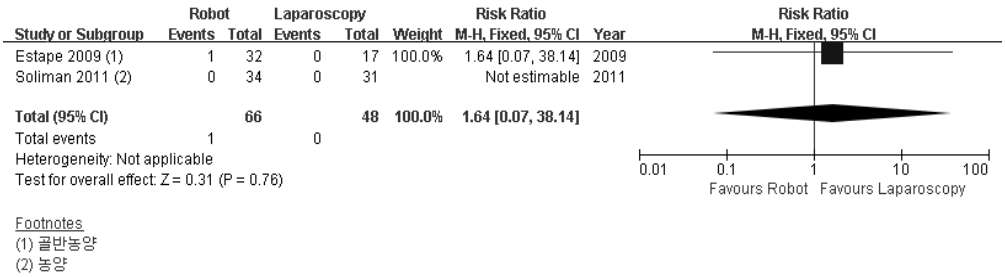


그림 140. [자궁경부암] 농양: 로봇수술 vs 복강경수술

15) 색혈전증(Embolism/thrombosis)

그림 141. [자궁경부암] 색혈전증: 로봇수술 vs 복강경수술

16) 폐렴(Pneumonia)

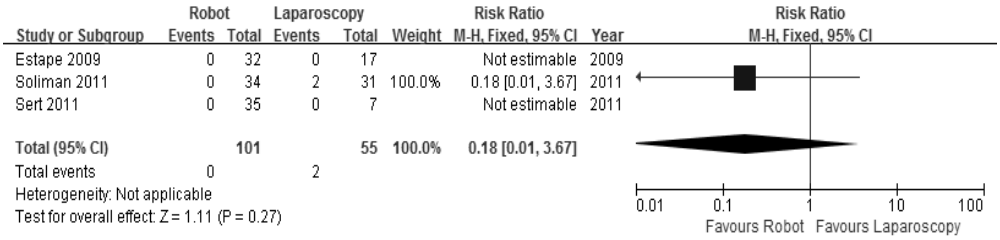


그림 142. [자궁경부암] 폐렴: 로봇수술 vs 복강경수술

17) 발열(Fever)

그림 143. [자궁경부암] 발열: 로봇수술 vs 복강경수술

7. 폐 및 기관지암

7.1. 문헌 검색 전략

가. 국외 데이터 베이스 〈검색일자: 2014. 07. 07〉

1) Ovid MEDLINE(R) In-Process &Other Non-Indexed Citations and Ovid MEDLINE(R)1946 to Present

#	Searches	Ovid Medline
1	exp Lung Neoplasms/	173,585
2	exp Bronchial Neoplasms/	50,623
3	((lung or bronch* or pulmo*) adj5 (neoplas* or cancer* or carcin* or tumo?r* or malignan*)).mp.	223,119
4	((lung or bronch* or pulmo*) adj5 (resec* or lobect*)).mp.	18,249
5	1 or 2 or 3 or 4	231,341
6	robotics.mp. or exp robotics/	14,919
7	Surgery, Computer-assisted.mp. or exp Surgery, Computer-Assisted/	9,809
8	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus).mp.	22,196
9	6 or 7 or 8	30,042
10	5 and 9	399
11	animal/ not human/	3,873,264
12	10 not 11	384

2) Ovid EMBASE 1974 to 2014 July 02

#	Searches	EMBASE
1	exp Lung Neoplasms/	262,312
2	exp Bronchial Neoplasms/	8,835
3	((lung or bronch* or pulmo*) adj5 (neoplas* or cancer* or carcin* or tumo?r* or malignan*)).mp.	308,540
4	((lung or bronch* or pulmo*) adj5 (resec* or lobect*)).mp.	44,650
5	1 or 2 or 3 or 4	349,284
6	robotics.mp. or exp robotics/	23,962

#	Searches	EMBASE
7	computer assisted surgery.mp. or exp computer assisted surgery/	6,820
8	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus).mp.	34,607
9	6 or 7 or 8	39,847
10	5 and 9	682
11	animal/ not human/	1,190,761
12	10 not 11	676

3) Cochrane Library

#	Searches	Cochrane
1	MeSH descriptor: [Lung Neoplasms] explode all trees	4,886
2	MeSH descriptor: [Bronchial Neoplasms] explode all trees	2,712
3	((lung or bronch* or pulmo*) near/5 (neoplas* or cancer* or carcin* or tumo?r* or malignan*))	9,804
4	((lung or bronch* or pulmo*) near/5 (resec* or lobect*))	827
5	#1 or #2 or #3 or #4	10,107
6	MeSH descriptor: [Robotics] explode all trees	513
7	MeSH descriptor: [Surgery, Computer-Assisted] explode all trees	530
8	(Surgery, Computer-assisted):ti,ab,kw	1,284
9	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus):ti,ab,kw	1,155
10	#6 or #7 or #8 or #9	2,328
11	#5 and #10	43

나. 국내 데이터 베이스 〈검색일자: 2014.07.07.〉

1) Koreamed

#	Searches	KoreaMed
1	robot* AND lung*	8
2	telerobot* AND lung*	0

#	Searches	KoreaMed
3	remote surg* AND lung*	6
4	remote operation* AND lung*	1
5	davinci AND lung*	0
6	"da vinci" AND lung*	0
7	Zeus AND lung*	0
8	robot* AND bronch*	0
9	telerobot* AND bronch*	0
10	remote surg* AND bronch*	1
11	remote operation* AND bronch*	0
12	davinci AND bronch*	0
13	"da vinci" AND bronch*	0
14	Zeus AND bronch*	0

2) Kmbase

#	Searches	KMbase
1	(lung or bronchial) AND (robot OR telerobot OR remote surgery OR da vinchi OR vinci or zeus)	10
2	(폐 OR 기관지) AND (로봇 OR 다빈치)	10

3) RISS

#	Searches	RISS
1	(lung OR bronchial) 결과내재검색 robot	10
2	(lung OR bronchial) 결과내재검색 telerobot	0
3	(lung OR bronchial) 결과내재검색 remote surgery	4
4	(lung OR bronchial) 결과내재검색 da vinci	1
5	(lung OR bronchial) 결과내재검색 vinci	1
6	(lung OR bronchial) 결과내재검색 zeus	0
7	폐 AND 로봇	12
8	폐 AND 다빈치	1
9	기관지 AND 로봇	1
10	기관지 AND 다빈치	0

4) KISS

#	Searches	KISS
1	(lung OR bronchial) 결과내재검색 robot	1
2	(lung OR bronchial) 결과내재검색 telerobot	0
3	(lung OR bronchial) 결과내재검색 remote surgery	0
4	(lung OR bronchial) 결과내재검색 da vinci	0
5	(lung OR bronchial) 결과내재검색 vinci	0
6	(lung OR bronchial) 결과내재검색 zeus	0
7	(폐 OR 기관지) 결과내재검색 로봇	2
8	(폐 OR 기관지) 결과내재검색 다빈치	0

5) KISTI

#	Searches	KISTI
1	(BI: lung* OR BI: bronchial*) 결과내재검색 robot	7
2	(BI: lung* OR BI: bronchial*) 결과내재검색 telerobot	0
3	(BI: lung* OR BI: bronchial*) 결과내재검색 remote surgery	7
4	(BI: lung* OR BI: bronchial*) 결과내재검색 da vinci	2
5	(BI: lung* OR BI: bronchial*) 결과내재검색 vinci	2
6	(BI: lung* OR BI: bronchial*) 결과내재검색 zeus	0
7	(BI: 폐암* OR BI: 기관지암*) 결과내재검색 로봇	3
8	(BI: 폐암* OR BI: 기관지암*) 결과내재검색 다빈치	1

7.2. 최종 선택문헌 목록

번호	1저자	연도	제목	저널
1	He	2014	Evaluation of a robot-assisted video-assisted thoracoscopic surgery programme	Experimental and therapeutic medicine
2	Oh	2013	Early Adoption of Robotic Pulmonary Lobectomy: Feasibility and Initial Outcomes	The American surgeon
3	Jang	2011	Comparison of the Early Robot-Assisted Lobectomy Experience to Video-Assisted	Innovations (Philadelphia, Pa)

번호	1저자	연도	제목	저널
			Thoracic Surgery Lobectomy for Lung Cancer A Single-Institution Case Series Matching Study	
4	Lee	2014	Transitioning from video-assisted thoracic surgical lobectomy to robotics for lung cancer: Are there outcomes advantages?	The Journal of Thoracic and Cardiovascular Surgery
5	Veronesi	2010	Four-arm robotic lobectomy for the treatment of early-stage lung cancer	The Journal of thoracic and cardiovascular surgery
6	Augustin	2013	Initial experience with robotic lung lobectomy: report of two different approaches	Surgical endoscopySurg Endosc
7	Bodner	2011	Minimally invasive approaches for lung lobectomy - from VATS to robotic and back	European Surgery - Acta Chirurgica Austriaca

7.3. 문헌배제사유 및 배제문헌목록

① 폐 및 기관지암 대상이 아닌 문헌
② 로봇수술 대상이 아닌 문헌
③ 개흉수술이나 흉강경수술과 비교 분석되지 않은 연구
④ 적절한 결과변수가 보고되지 않은 경우
⑤ 동물실험 및 전임상시험 연구
⑥ 무작위비교임상시험이나 비무작위임상연구가 아닌 연구
⑦ 원저가 아닌 연구
⑧ 초록만 발표된 연구
⑨ 동료심사를 거쳐 학술지에 게재된 연구가 아닌 문헌
⑩ 한국어, 영어로 출판되지 않은 문헌
⑪ 중복 출판 문헌
⑫ 원문 확보 불가 문헌

연번	배제 문헌	배제사유
1	Augustin F, Bodner J, Maier H, Schwinghammer C, Pichler B, Lucciarini P, et al. Robotic-assisted minimally invasive vs. thoracoscopic lung lobectomy: comparison of perioperative results in a learning curve setting. Langenbecks Arch Surg. 2013 Aug;398(6):895-901.	②
2	Augustin F, Bodner J, Wykypiel H, Schwinghammer C, Schmid T. Initial experience with robotic lung lobectomy: report of two different approaches. Surg Endosc. 2011 Jan;25(1):108-13.	③

연번	배제 문헌	배제사유
3	Balduyck B, Hendriks JM, Lauwers P, Mercelis R, Broecke P, Schil P. Quality of life after anterior mediastinal mass resection: A prospective study comparing open with robotic-assisted thoracoscopic resection. European journal of cardio-thoracic surgery [Internet]. 2011; 39(4):[543-8 pp.].	①
4	Bryant AS, Minnich DJ, Wei B, Cerfolio RJ. The incidence and management of postoperative chylothorax after pulmonary resection and thoracic mediastinal lymph node dissection. Annals of Thoracic Surgery. 2014 Jul;98(1):232-7.	①
5	Cerfolio RJ, Bryant AS, Skylizard L, Minnich DJ. Initial consecutive experience of completely portal robotic pulmonary resection with 4 arms. J Thorac Cardiovasc Surg. 2011 Oct;142(4):740-6.	②
6	De LSR, Hon JK, Bateman E, Roberts S. Minimally invasive anterior thoracotomy for routine lung cancer resection. Innovations. 2007 Mar;2(2):76-83.	③
7	De LSR, Hon JKF, Bateman E, Roberts S. Minimally invasive anterior thoracotomy for routine lung cancer resection. Innovations: Technology and Techniques in Cardiothoracic and Vascular Surgery. 2007 March;2(2):76-83.	③
8	Deen SA, Wilson JL, Wilshire CL, Vallieres E, Farivar AS, Aye RW, et al. Defining the cost of care for lobectomy and segmentectomy: a comparison of open, video-assisted thoracoscopic, and robotic approaches. Annals of Thoracic Surgery. 2014 Mar;97(3):1000-7.	①
9	Farivar AS, Cerfolio RJ, Vallieres E, Knight AW, Bryant A, Lingala V, et al. Comparing robotic lung resection with thoracotomy and video-assisted thoracoscopic surgery cases entered into the Society of Thoracic Surgeons database. Innovations. 2014 Jan-Feb;9(1):10-5.	①
10	Fortes DL, Tomaszek SC, Wigle DA. Early experience with robotic-assisted lung resection. Innovations. 2011 Jul;6(4):237-42.	③
11	Kent M, Wang T, Whyte R, Curran T, Flores R, Gangadharan S. Open, video-assisted thoracic surgery, and robotic lobectomy: review of a national database. Annals of Thoracic Surgery. 2014 Jan;97(1):236-42; discussion 42-4.	②
12	Li G. Minimally invasive therapy for lung cancer: We are on the way for international consensus. Journal of Thoracic Disease. 2014;6(5):399-404.	⑦
13	Nasir BS, Bryant AS, Minnich DJ, Wei B, Cerfolio RJ. Performing robotic lobectomy and segmentectomy: cost, profitability, and outcomes. Annals of Thoracic Surgery. 2014 Jul;98(1):203-9.	③
14	Palade E, Passlick B, Osei-Agyemang T, Gunter J, Wiesemann S. Video-assisted vs open mediastinal lymphadenectomy for Stage I non-small-cell lung cancer: Results of a prospective randomized trial. European journal of cardio-thoracic surgery [Internet]. 2013; 44(2):[244-9 pp.].	②
15	Park BJ, Flores RM. Cost comparison of robotic, video-assisted thoracic surgery and thoracotomy approaches to pulmonary lobectomy. Thoracic Surgery	②

연번	배제 문헌	배제사유
	Clinics. 2008 Aug;18(3)	
16	Park BJ, Melfi F, Mussi A, Maisonneuve P, Spaggiari L, Da Silva RK, et al. Robotic lobectomy for non-small cell lung cancer (NSCLC): long-term oncologic results. J Thorac Cardiovasc Surg. 2012 Feb;143(2):383-9.	③
17	Park BJ. Robotic lobectomy for non-small cell lung cancer (NSCLC): Multi-center registry study of long-term oncologic results. Ann. 2012 May;1(1):24-6.	③
18	Sert MB, Abeler V. Robot-assisted laparoscopic radical hysterectomy: comparison with total laparoscopic hysterectomy and abdominal radical hysterectomy; one surgeon's experience at the Norwegian Radium Hospital. Gynecologic Oncology. 2011 Jun 1;121(3):600-4.	①
19	Swanson SJ, Miller DL, McKenna Jr RJ, Howington J, Marshall MB, Yoo AC, et al. Comparing robot-assisted thoracic surgical lobectomy with conventional video-assisted thoracic surgical lobectomy and wedge resection: Results from a multihospital database (Premier). Journal of Thoracic and Cardiovascular Surgery. 2014 March;147(3):929-37.	⑥
20	Van't westeinde SC, Horeweg N, leyn P, Groen HJM, Lammers JJ, Weenink C, et al. Complications following lung surgery in the dutch-belgian randomized lung cancer screening trial. European Journal of Cardio-thoracic Surgery [Internet]. 2012; 42(3):[420-9 pp.].	②
21	Veronesi G, Agoglia BG, Melfi F, Maisonneuve P, Bertolotti R, Bianchi PP, et al. Experience with robotic lobectomy for lung cancer. Innovations. 2011 Nov;6(6):355-60.	③

7.4. 개별합병증 Forest plot

가. 로봇수술 VS 개흉수술

1) 장기간 공기누출

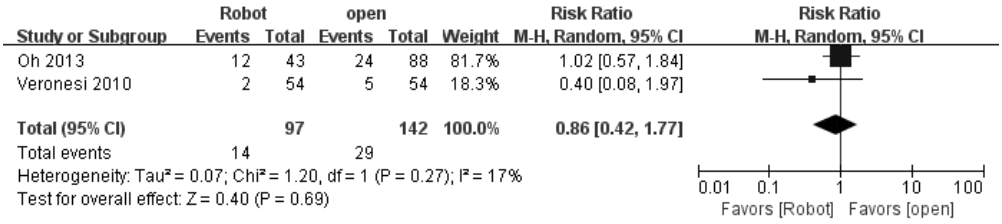


그림 144. [폐 및 기관지암] 장기간 공기 누출 발생률: 로봇수술 vs 개흉수술

2) 심방세동

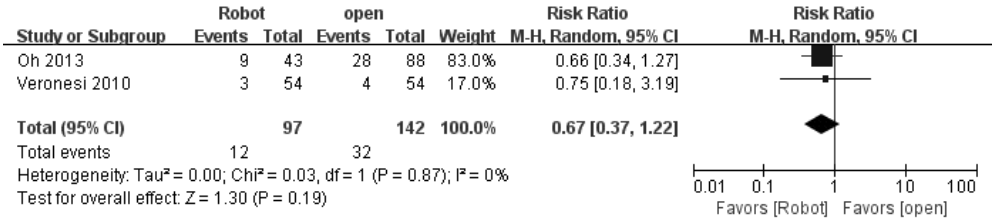


그림 145. [폐 및 기관지암] 심방세동 발생률: 로봇수술 vs 개흉수술

3) 심근경색

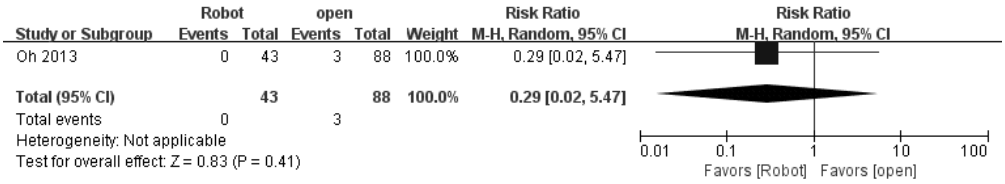


그림 146. [폐 및 기관지암] 심근경색 발생률: 로봇수술 vs 개흉수술

4) 폐렴

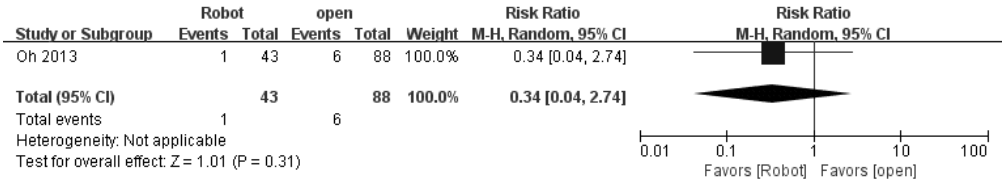


그림 147. [폐 및 기관지암] 폐렴 발생률: 로봇수술 vs 개흉수술

나. 로봇수술 VS 흉강경수술

1) 장기간 공기 누출

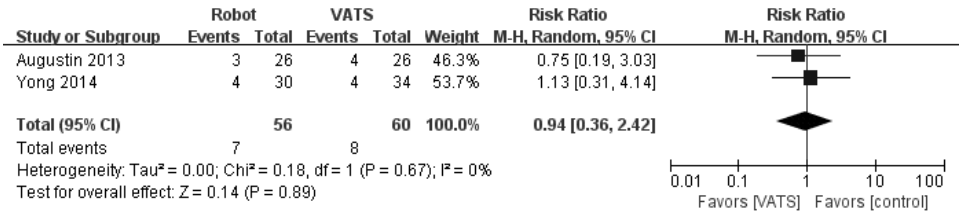


그림 148. [폐 및 기관지암] 장기간 공기 누출 발생률: 로봇수술 vs 흉강경수술

2) 무기폐/폐허탈

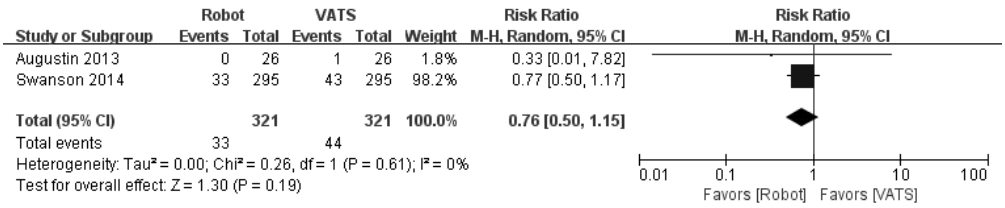


그림 149. [폐 및 기관지암] 무기폐/폐허탈 발생률: 로봇수술 vs 흉강경수술

8. 구강 및 인후두암

8.1. 문헌 검색 전략

가. 국외 데이터 베이스 〈검색일자: 2014. 07. 22〉

1) Ovid MEDLINE(R) In-Process &Other Non-Indexed Citations and Ovid MEDLINE(R)1946 to Present

#	Searches	Ovid Medline
1	exp Mouth neoplasms/	54,902
2	exp Otorhinolaryngologic Neoplasms/	71,744
3	exp "Head and Neck Neoplasms"/	241,030
4	((cancer or carcinoma or neoplas* or malignan* or tumo* or sarcoma*) adj5 (mouth or oral or tongue or lip* or cheek or gingiva* or gum* or palat* or neck or throat or pharyn* or oropharyn* or tonsil* or hypopharyn* or piriform sinus or laryn* or supraglot* or subglot* or glot* or adenoid* or otorhinolaryn* or mandib* or submandib* or sublingual or ((accessory or salivary or minor or major) and gland))).mp.	171,988
5	(Pharyngectom* or Oropharyngectom* or Laryngopharyngectom* or Tonsillectom* or Adenoidectom* or Laryngectom* or Parotidectom* or Cordectom* or Submandibular gland resection or glossectom* or Mandibulectom* or Mandibulotom* or Maxillectom*).mp.	26,118
6	or/1-5	313,216
7	Robotics.mp. or exp Robotics/	15,003
8	Surgery, Computer-assisted.mp. or exp Surgery, Computer-Assisted/	9,851
9	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus).mp.	22,319
10	or/7-9	30,197
11	6 and 10	771
12	((cancer or carcinoma or neoplas* or malignan* or tumo* or sarcoma*) adj5 thyroid*).mp. or exp Thyroid Neoplasms/	47,699
13	11 not 12	617

2) Ovid EMBASE 1974 to 2014 June 06

#	Searches	EMBASE
1	exp Mouth neoplasms/	84,145
2	exp "Head and Neck Neoplasms"/	229,835
3	((cancer or carcinoma or neoplas* or malignan* or tumo* or sarcoma*) adj5 (mouth or oral or tongue or lip* or cheek or gingiva* or gum* or palat* or neck or throat or pharyn* or oropharyn* or tonsil* or hypopharyn* or piriform sinus or laryn* or supraglot* or subglot* or glot* or adenoid* or otorhinolaryn* or mandib* or submandib* or sublingual or ((accessory or salivary or minor or major) and gland))).mp.	256,989
4	(Pharyngectom* or Oropharyngectom* or Laryngopharyngectom* or Tonsillectom* or Adenoidectom* or Laryngectom* or Parotidectom* or Cordectom* or Submandibular gland resection or glossectom* or Mandibulectom* or Mandibulotom* or Maxillectom*).mp.	32,181
5	or/1-4	375,815
6	Robotic.mp. or exp Robotics/	29,843
7	computer assisted surgery.mp. or exp computer assisted surgery/	6,789
8	4(robot* or telerobot* or remote surg* or remote or operat* or (da vinci or davinci) or Zeus).mp.	33,793
9	or/6-8	40,083
10	5 and 9	875
11	((cancer or carcinoma or neoplas* or malignan* or tumo* or sarcoma*) adj5 thyroid*).mp. or exp Thyroid Neoplasms/	67,789
12	10 not 11	833

3) Cochrane Library

#	Searches	Cochrane
1	MeSH descriptor: [Mouth neoplasms] explode all trees	494
2	MeSH descriptor: [Otorhinolaryngologic Neoplasms] explode all trees	801
3	MeSH descriptor: [Head and Neck Neoplasms] explode all trees	3,972

4	((cancer or carcinoma or neoplas* or malignan* or tumo* or sarcoma*) Near/5 (mouth or oral or tongue or lip* or cheek or gingiva* or gum* or palat* or neck or throat or pharyn* or oropharyn* or tonsil* or hypopharyn* or piriform sinus or laryn* or supraglot* or subglot* or glot* or adenoid* or otorhinolaryn* or mandib* or submandib* or sublingual or ((accessory or salivary or minor or major) and gland))):ti,ab,kw	6,250
5	(Pharyngectom* or Oropharyngectom* or Laryngopharyngectom* or Tonsillectom* or Adenoidectom* or Laryngectom* or Parotidectom* or Cordectom* or Submandibular gland resection or glossectom* or Mandibulectom* or Mandibulotom* or Maxillectom*):ti,ab,kw	2,218
6	#1 or #2 or #3 or #4 or #5	10,038
7	MeSH descriptor: [Robotics] explode all trees	513
8	MeSH descriptor: [Surgery, Computer-Assisted] explode all trees	530
9	(Surgery, Computer-assisted):ti,ab,kw	1,284
10	(robot* or telerobot* or remote surg* or remote operat* or (da vinci or davinci) or Zeus):ti,ab,kw	1,155
11	#7 or #8 or #9 or #10	2,328
12	#6 and #11	56
	Cochrane review 1; Other reviews 1; Trials 50; Technology Assessments 1; Economic Evaluations 3	

나. 국내 데이터 베이스 〈검색일자: 2014.07.23.〉

1) Koreamed

#	Searches	Koreamed
1	robot* AND neck	24
2	telerobot* AND neck	0
3	remote surg* AND neck	6
4	remote operation* AND neck	3
5	davinci AND neck	0
6	"da vinci" AND neck	0
7	Zeus AND neck	0
8	robot* AND oral	12
9	telerobot* AND oral	0

#	Searches	Koreamed
10	remote surg* AND oral	0
11	remote operation* AND oral	1
12	davinci AND oral	1
13	"da vinci" AND oral	0
14	Zeus AND oral	0
15	robot* AND tongue	1
16	telerobot* AND tongue	0
17	remote surg* AND tongue	0
18	remote operation* AND tongue	0
19	davinci AND tongue	0
20	"da vinci" AND tongue	0
21	Zeus AND tongue	0
22	robot* AND pharyn*	1
23	telerobot* AND pharyn*	0
24	remote surg* AND pharyn*	1
25	remote operation* AND pharyn*	2
26	davinci AND pharyn*	0
27	"da vinci" AND pharyn*	0
28	Zeus AND pharyn*	0
29	robot* AND laryn*	6
30	telerobot* AND laryn*	0
31	remote surg* AND laryn*	0
32	remote operation* AND laryn*	1
33	davinci AND laryn*	0
34	"da vinci" AND laryn*	0
35	Zeus AND laryn*	0
36	robot* AND tonsil*	2
37	telerobot* AND tonsil*	0
38	remote surg* AND tonsil*	1
39	remote operation* AND tonsil*	0
40	davinci AND tonsil*	0
41	"da vinci" AND tonsil*	0
42	Zeus AND tonsil*	0
43	robot* AND oropharyn*	5
44	telerobot* AND oropharyn*	0
45	remote surg* AND oropharyn*	0
46	remote operation* AND oropharyn*	0
47	davinci AND oropharyn*	0
48	"da vinci" AND oropharyn*	0
49	Zeus AND oropharyn*	0
50	robot* AND hypopharyn*	3

#	Searches	Koreamed
51	telerobot* AND hypopharyn*	0
52	remote surg* AND hypopharyn*	0
53	remote operation* AND hypopharyn*	0
54	davinci AND hypopharyn*	0
55	"da vinci" AND hypopharyn*	0
56	Zeus AND hypopharyn*	0
57	robot* AND adenoid*	0
58	telerobot* AND adenoid*	0
59	remote surg* AND adenoid*	0
60	remote operation* AND adenoid*	0
61	davinci AND adenoid*	0
62	"da vinci" AND adenoid*	0
63	Zeus AND adenoid*	0
64	robot* AND glot*	0
65	telerobot* AND glot*	0
66	remote surg* AND glot*	0
67	remote operation* AND glot*	0
68	davinci AND glot*	0
69	"da vinci" AND glot*	0
70	Zeus AND glot*	0
71	robot* AND supraglot*	1
72	telerobot* AND supraglot*	0
73	remote surg* AND supraglot*	0
74	remote operation* AND supraglot*	0
75	davinci AND supraglot*	0
76	"da vinci" AND supraglot*	0
77	Zeus AND supraglot*	0
78	robot* AND subglot*	0
79	telerobot* AND subglot*	0
80	remote surg* AND subglot*	0
81	remote operation* AND subglot*	0
82	davinci AND subglot*	0
83	"da vinci" AND subglot*	0
84	Zeus AND subglot*	0
	중복 제거 최종	46

2) Kmbase

#	Searches	KMbase
1	(neck or oral or tongue or pharyngeal or oropharyngeal or hypopharyngeal or laryngeal or supraglottic or subglottic or glottic or tonsilar or adenoidal) AND (robot or telerobot or remote or vinci or davinci or zeus)	68
2	(인두 or 후두 or 편도 or 경구강 or 경부 or 구강) AND (로봇 or 다빈치)	8
	중복 제거 최종	69

3) RISS

#	Searches	RISS
1	(neck or oral or tongue) 결과내 재검색 robot	31
2	(neck or oral or tongue) 결과내 재검색 telerobot	0
3	(neck or oral or tongue) 결과내 재검색 remote	31
4	(neck or oral or tongue) 결과내 재검색 vinci	8
5	(neck or oral or tongue) 결과내 재검색 davinci	1
6	(neck or oral or tongue) 결과내 재검색 zeus	2
7	(pharyngeal or laryngeal or tonsilar) 결과내 재검색 robot	3
8	(pharyngeal or laryngeal or tonsilar) 결과내 재검색 telerobot	0
9	(pharyngeal or laryngeal or tonsilar) 결과내 재검색 remote	3
10	(pharyngeal or laryngeal or tonsilar) 결과내 재검색 vinci	0
11	(pharyngeal or laryngeal or tonsilar) 결과내 재검색 davinci	0
12	(pharyngeal or laryngeal or tonsilar) 결과내 재검색 zeus	0
13	(glottic or supraglottic or subglottic) 결과내 재검색 robot	0
14	(glottic or supraglottic or subglottic) 결과내 재검색 telerobot	0
15	(glottic or supraglottic or subglottic) 결과내 재검색 remote	0
16	(glottic or supraglottic or subglottic) 결과내 재검색 vinci	0
17	(glottic or supraglottic or subglottic) 결과내 재검색 davinci	0
18	(glottic or supraglottic or subglottic) 결과내 재검색 zeus	0
19	(oropharyngeal or hypopharyngeal or adenoidal) 결과내 재검색 robot	0
20	(oropharyngeal or hypopharyngeal or adenoidal) 결과내 재검색 telerobot	0
21	(oropharyngeal or hypopharyngeal or adenoidal) 결과내 재검색 remote	0
22	(oropharyngeal or hypopharyngeal or adenoidal) 결과내 재검색 vinci	0
23	(oropharyngeal or hypopharyngeal or adenoidal) 결과내 재검색 davinci	0
24	(oropharyngeal or hypopharyngeal or adenoidal) 결과내 재검색 zeus	0
25	(인두 or 후두 or 편도) 결과내검색 로봇	2

#	Searches	RISS
26	(인두 or 후두 or 편도) 결과내검색 다빈치	0
27	(경구강 or 경부 or 구강) 결과내검색 로봇	7
28	(경구강 or 경부 or 구강) 결과내검색 다빈치	2
	중복 제거 최종	74

4) KISS

#	Searches	KISS
1	(neck or oral or pharyngeal or laryngeal or tonsilar) 결과내재검색 robot	1
2	(neck or oral or pharyngeal or laryngeal or tonsilar) 결과내재검색 telerobot	0
3	(neck or oral or pharyngeal or laryngeal or tonsilar) 결과내재검색 remote	1
4	(neck or oral or pharyngeal or laryngeal or tonsilar) 결과내재검색 vinci	0
5	(neck or oral or pharyngeal or laryngeal or tonsilar) 결과내재검색 davinci	0
6	(neck or oral or pharyngeal or laryngeal or tonsilar) 결과내재검색 zeus	0
7	(tongue or oropharyngeal or hypopharyngeal or glottic or adenoidal) 결과내재검색 robot	0
8	(tongue or oropharyngeal or hypopharyngeal or glottic or adenoidal) 결과내재검색 telerobot	0
9	(tongue or oropharyngeal or hypopharyngeal or glottic or adenoidal) 결과내재검색 remote	0
10	(tongue or oropharyngeal or hypopharyngeal or glottic or adenoidal) 결과내재검색 vinci	0
11	(tongue or oropharyngeal or hypopharyngeal or glottic or adenoidal) 결과내재검색 davinci	0
12	(tongue or oropharyngeal or hypopharyngeal or glottic or adenoidal) 결과내재검색 zeus	0
13	(supraglottic or subglottic) 결과내재검색 robot	0
14	(supraglottic or subglottic) 결과내재검색 telerobot	0
15	(supraglottic or subglottic) 결과내재검색 remote	0
16	(supraglottic or subglottic) 결과내재검색 vinci	0
17	(supraglottic or subglottic) 결과내재검색 davinci	0
18	(supraglottic or subglottic) 결과내재검색 zeus	0
19	(인두 or 후두 or 편도) 결과내재검색 로봇	0
20	(인두 or 후두 or 편도) 결과내재검색 다빈치	0
21	(경구강 or 경부 or 구강) 결과내 검색 로봇	1
22	(경구강 or 경부 or 구강) 결과내 검색 다빈치	0
	중복 제거 최종	3

5) KISTI

#	Searches	KISTI
1	(BI: neck) OR (BI: oral) 결과내재검색 telerobot	0
2	(BI: tongue) OR (BI: pharyn*) 결과내재검색 telerobot	0
3	(BI: laryn*) OR (BI: tonsil*) 결과내재검색 telerobot	0
4	(BI: glot*) OR (BI: supraglot*) 결과내재검색 telerobot	0
5	(BI: subglot*) OR (BI: oropharyn*) 결과내재검색 telerobot	0
6	(BI: hypopharyn*) OR (BI: adenoid*) 결과내재검색 telerobot	0
7	(BI: neck) OR (BI: oral) 결과내재검색 remote surgery	3
8	(BI: tongue) OR (BI: pharyn*) 결과내재검색 remote surgery	0
9	(BI: laryn*) OR (BI: tonsil*) 결과내재검색 remote surgery	0
10	(BI: glot*) OR (BI: supraglot*) 결과내재검색 remote surgery	0
11	(BI: subglot*) OR (BI: oropharyn*) 결과내재검색 remote surgery	0
12	(BI: hypopharyn*) OR (BI: adenoid*) 결과내재검색 remote surgery	0
13	(BI: neck) OR (BI: oral) 결과내재검색 da vinci	9
14	(BI: tongue) OR (BI: pharyn*) 결과내재검색 da vinci	2
15	(BI: laryn*) OR (BI: tonsil*) 결과내재검색 da vinci	3
16	(BI: glot*) OR (BI: supraglot*) 결과내재검색 da vinci	0
17	(BI: subglot*) OR (BI: oropharyn*) 결과내재검색 da vinci	2
18	(BI: hypopharyn*) OR (BI: adenoid*) 결과내재검색 da vinci	3
19	(BI: neck) OR (BI: oral) 결과내재검색 vinci	9
20	(BI: tongue) OR (BI: pharyn*) 결과내재검색 vinci	2
21	(BI: laryn*) OR (BI: tonsil*) 결과내재검색 vinci	3
22	(BI: glot*) OR (BI: supraglot*) 결과내재검색 vinci	0
23	(BI: subglot*) OR (BI: oropharyn*) 결과내재검색 vinci	2
24	(BI: hypopharyn*) OR (BI: adenoid*) 결과내재검색 vinci	3
25	(BI: neck) OR (BI: oral) 결과내재검색 zeus	0
26	(BI: tongue) OR (BI: pharyn*) 결과내재검색 zeus	0
27	(BI: laryn*) OR (BI: tonsil*) 결과내재검색 zeus	0
28	(BI: glot*) OR (BI: supraglot*) 결과내재검색 zeus	0
29	(BI: subglot*) OR (BI: oropharyn*) 결과내재검색 zeus	0
30	(BI: hypopharyn*) OR (BI: adenoid*) 결과내재검색 zeus	0
31	(BI: 인두*) OR (BI: 후두*) OR 결과내재검색 로봇*	1
32	(BI: 편도*) OR (BI: 경부*) OR 결과내재검색 로봇*	9

#	Searches	KISTI
33	(BI: 경구강*) OR (BI: 구강*) OR 결과내재검색 로봇*	4
34	(BI: 인두*) OR (BI: 후두*) OR 결과내재검색 다빈치*	0
35	(BI: 편도*) OR (BI: 경부*) OR 결과내재검색 다빈치*	3
36	(BI: 경구강*) OR (BI: 구강*) OR 결과내재검색 다빈치*	1
	중복 제거 최종	21

8.2. 최종 선택문헌 목록

번호	1저자	연도	제목	저널
1	Dean	2010	Robotic-assisted surgery for primary or recurrent oropharyngeal carcinoma.	Head & Neck Surgery
2	White	2013	Salvage surgery for recurrent cancers of the oropharynx: comparing TORS with standard open surgical approaches.	JAMA Otolaryngology-Head & Neck Surgery
3	Park	2013a	Comparison study of transoral robotic surgery and radical open surgery for hypopharyngeal cancer.	Acta Oto-Laryngologica
4	Park	2013b	Comparison of treatment outcomes after transoral robotic surgery and supraglottic partial laryngectomy: our experience with seventeen and seventeen patients respectively.	Clinical Otolaryngology
5	Hammoudi	2014	Transoral robotic surgery versus conventional surgery in treatment for squamous cell carcinoma of the upper aerodigestive tract.	Head & Neck Surgery
6	Park	2013	Comparison of oncologic and functional outcomes after transoral robotic lateral oropharyngectomy versus conventional surgery for T1-T3 tonsillar cancer.	Head & neck
7	Ansarin	2014	Transoral robotic surgery vs transoral laser microsurgery for resection of supraglottic cancer: a pilot surgery.	The International Journal Of Medical Robotics + Computer Assisted Surgery
8	Sumer	2013	Transoral robotic surgery and transoral laser microsurgery for oropharyngeal squamous cell cancer.	Journal of Robotic Surgery
9	Tae	2014	Robotic selective neck dissection by a	Otolaryngology - Head

번호	1저자	연도	제목	저널
			postauricular facelift approach: comparison with conventional neck dissection.	& Neck Surgery
10	Kim	2014	Therapeutic robot-assisted neck dissection via a retroauricular or modified facelift approach in head and neck cancer: A comparative study with conventional transcervical neck dissection.	Head & neck.
11	Lee	2012	Robot-assisted Supraomohyoid neck dissection via a modified face-lift or retroauricular approach in early-stage cN0 squamous cell carcinoma of the oral cavity: a comparative study with conventional technique.	Annals of Surgical Oncology

8.3. 문헌배제사유 및 배제문헌목록

① 구강 및 인후두암 대상이 아닌 문헌
② 로봇수술을 시행한 대상이 아닌 문헌
③ 기존수술법과 비교 분석되지 않은 연구
④ 적절한 결과변수가 보고되지 않은 경우
⑤ 동물실험 및 전임상시험 연구
⑥ 무작위비교임상시험이나 비무작위임상연구가 아닌 연구
⑦ 원저가 아닌 연구
⑧ 초록만 발표된 연구
⑨ 동료심사를 거쳐 학술지에 게재된 연구가 아닌 문헌
⑩ 한국어, 영어로 출판되지 않은 문헌
⑪ 중복 출판 문헌
⑫ 원문 확보 불가 문헌

연번	배제 문헌	배제사유
1	Chen MM, Roman SA, Kraus DH, Sosa JA, Judson BL. Transoral robotic surgery: A population-level analysis. Otolaryngology - Head and Neck Surgery (United States). 2014 June;150(6):968-75.	①
2	De Virgilio A, Park YM, Kim WS, Byeon HK, Lee SY, Kim SH. Transoral robotic surgery for the resection of parapharyngeal tumour: our experience in ten patients. Clin Otolaryngol. 2012 Dec;37(6):483-8.	③
3	Ghanem TA. Transoral robotic-assisted microvascular reconstruction of the oropharynx. Laryngoscope. 2011 Mar;121(3):580-2.	③
4	Hurtuk A, Teknos T, Ozer E. Robotic-assisted lingual tonsillectomy. Laryngoscope. 2011 Jul;121(7):1480-2.	③
5	Lawson G, Mendelsohn AH, Van Der Vorst S, Bachy V, Remacle M. Transoral	⑦

연번	배제 문헌	배제사유
	robotic surgery total laryngectomy. Laryngoscope. 2013 Jan;123(1):193-6.	
6	Lee HS, Kim D, Lee SY, Byeon HK, Kim WS, Hong HJ, et al. Robot-assisted versus endoscopic submandibular gland resection via retroauricular approach: a prospective nonrandomized study. Br J Oral Maxillofac Surg. 2014 Feb;52(2):179-84.	①
7	Mukhija VK, Sung CK, Desai SC, Wanna G, Genden EM. Transoral robotic assisted free flap reconstruction. Otolaryngol Head Neck Surg. 2009 Jan;140(1):124-5.	⑤
8	Ozer E, Waltonen J. Transoral robotic nasopharyngectomy: a novel approach for nasopharyngeal lesions. Laryngoscope. 2008 Sep;118(9):1613-6.	⑥
9	Perrenot C, Berengere P, Mastronicola R, Gangloff P, Dolivet G. Infrahyoid myocutaneous flap for reconstruction after robotic transoral surgery for oropharyngeal tumors. Plast Reconstr Surg. 2014 Feb;133(2):236e-7e.	⑦
10	Richmon JD, Quon H, Gourin CG. The effect of transoral robotic surgery on short-term outcomes and cost of care after oropharyngeal cancer surgery. Laryngoscope. 2014 Jan;124(1):165-71.	①
11	Shah S, Goldenberg D. Robotic surgery for oropharyngeal cancer. Rambam Maimonides med. 2014 Apr;5(2):e0014.	⑦
12	Tae K, Ji YB, Song CM, Min HJ, Kim KR, Park CW. Robotic selective neck dissection using a gasless postauricular facelift approach for early head and neck cancer: technical feasibility and safety. J Laparoendosc Adv Surg Tech A. 2013 Mar;23(3):240-5.	③

8.4. 개별합병증 Forest plot

가. 로봇수술(TORS) VS 개경수술: 원발암

1) 인두피부누공

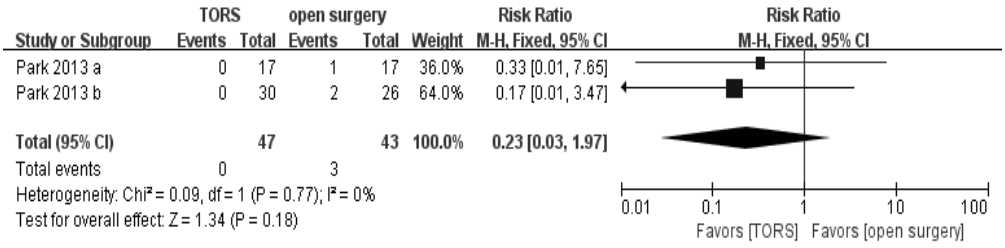


그림 150. [인후두암, 원발암] 인두피부누공 발생률: 로봇수술 vs 개경수술

2) 창상감염

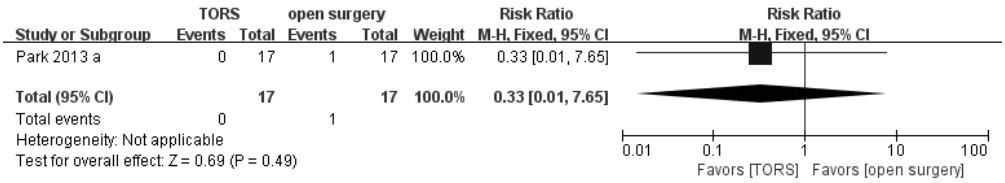


그림 151. [인후두암, 원발암] 창상감염 발생률: 로봇수술 vs 개경수술

3) 흡인성폐렴

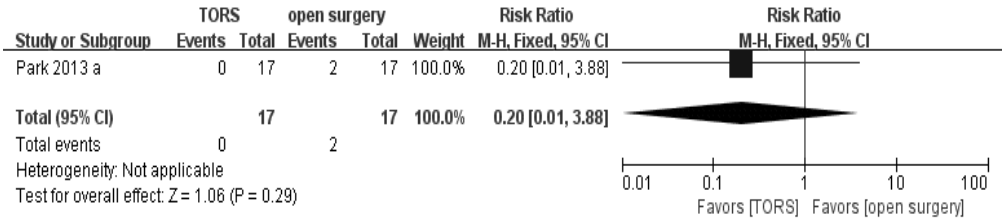


그림 152. [인후두암, 원발암] 흡인성폐렴 발생률: 로봇수술 vs 개경수술

4) 술후출혈

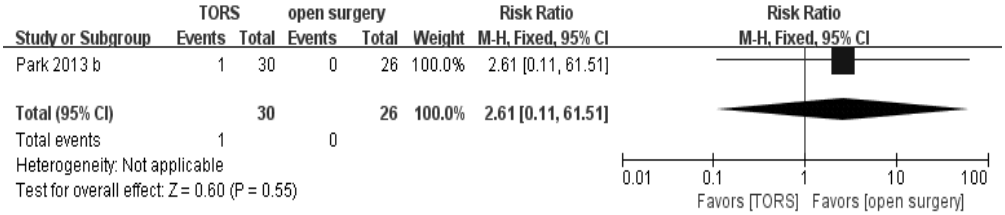


그림 153. [인후두암, 원발암] 술후출혈 발생률: 로봇수술 vs 개경수술

5) 후두협착

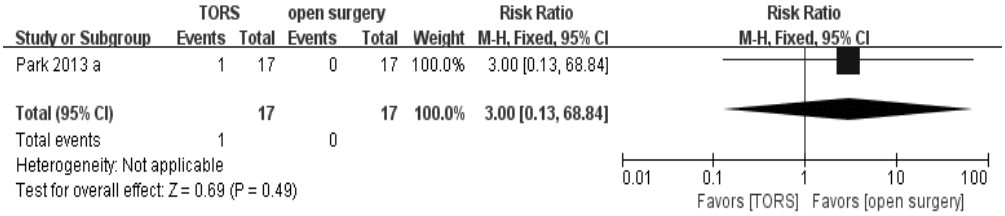


그림 154. [인후두암, 원발암] 후두협착 발생률: 로봇수술 vs 개경수술

나. 로봇수술(TORS) VS 개경수술: 재발암

1) 기도부종

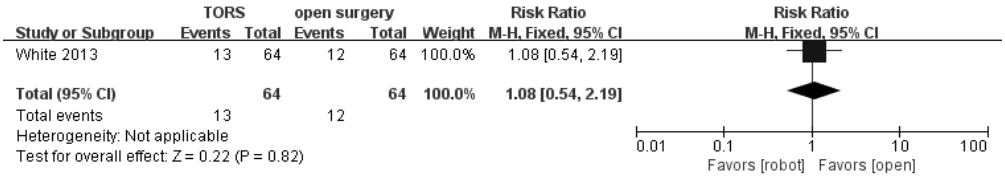


그림 155. [인후두암, 재발암] 기도부종 발생률: 로봇수술 vs 개경수술

2) 술후출혈

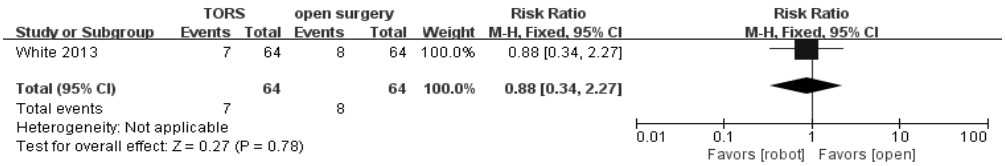


그림 156. [인후두암, 재발암] 술후출혈 발생률: 로봇수술 vs 개경수술

3) 인두피부누공

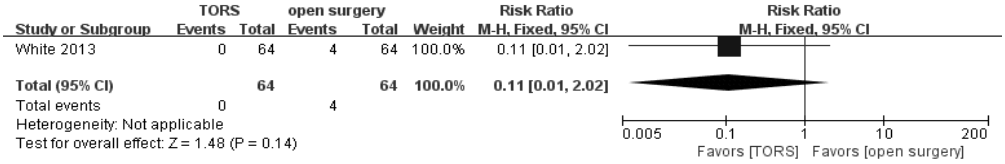


그림 157. [인후두암, 재발암] 인두피부누공 발생률: 로봇수술 vs 개경수술

4) 창상감염

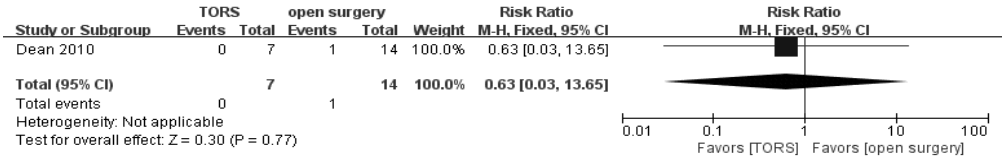


그림 158. [인후두암, 재발암] 창상감염 발생률: 로봇수술 vs 개경수술

5) 목농양

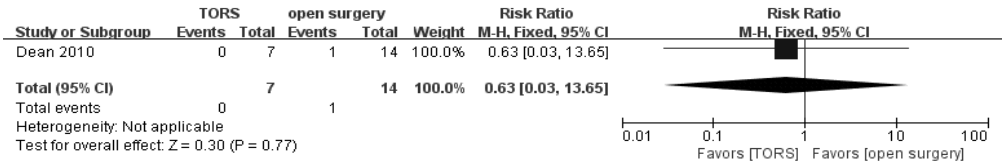


그림 159. [인후두암, 재발암] 목농양 발생률: 로봇수술 vs 개경수술

6) 혈종

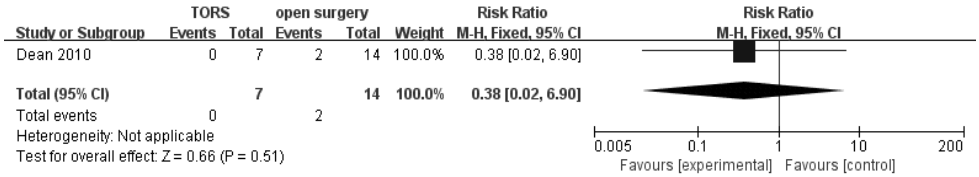


그림 160. [인후두암, 재발암] 혈종 발생률: 로봇수술 vs 개경수술

다. 로봇수술(TORS) VS 경구강레이저미세현미경수술: 원발암

1) 경부기능부전

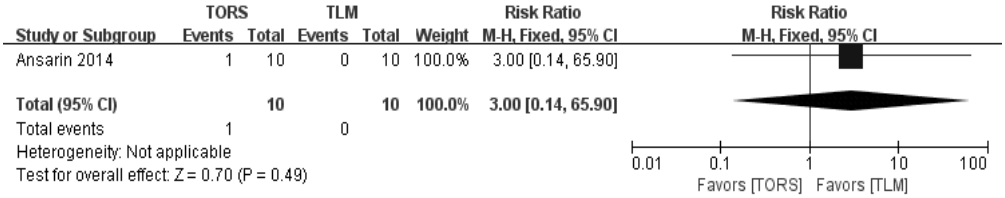


그림 161. [인후두암, 원발암] 경부기능부전 발생률: 로봇수술 vs 경구강레이저미세수술

2) 술후출혈

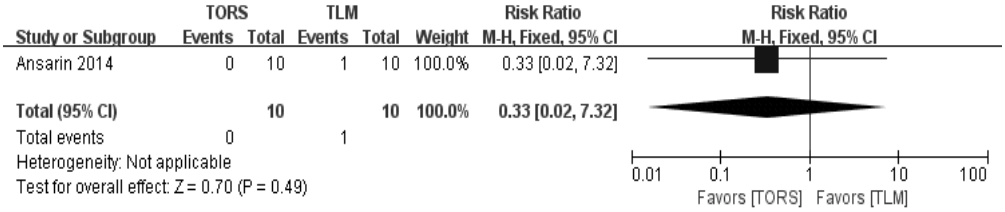


그림 162. [인후두암, 원발암] 술후출혈 발생률: 로봇수술 vs 경구강레이저미세수술

3) 혀열상

그림 163. [인후두암, 원발암] 혀열상 발생률: 로봇수술 vs 경구강레이저미세수술

4) 혀감각이상

그림 164. [인후두암, 원발암] 혀감각이상 발생률: 로봇수술 vs 경구강레이저미세수술

5) 흡인성폐렴

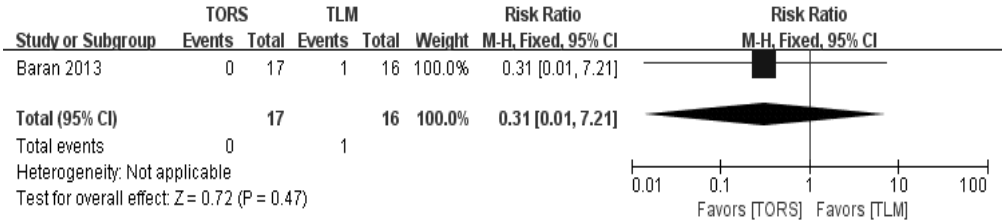


그림 165. [인후두암, 재발암] 흡인성폐렴 발생률: 로봇수술 vs 경구강레이저미세수술

6) 기도폐쇄

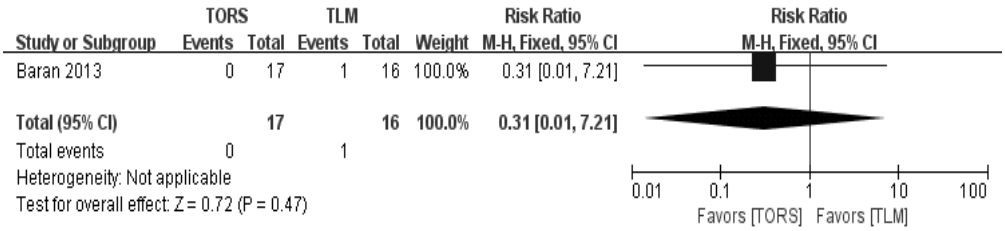


그림 166. [인후두암, 재발암] 기도폐쇄 발생률: 로봇수술 vs 경구강레이저미세수술

라. 로봇수술(RAND) VS 개경수술(기존 경부청소술)

1) 척수부신경 손상 및 절제(spinal accessory nerve injury)

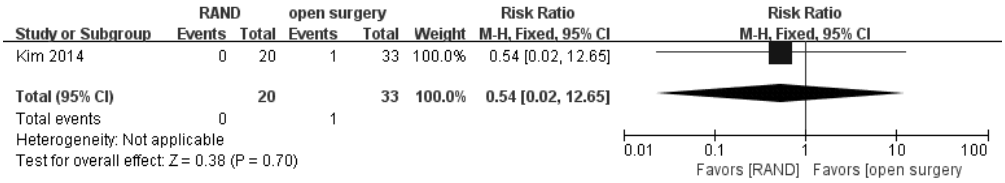


그림 167. [구강·인후두암] 척수부신경 손상 및 절제 발생률: 로봇수술 vs 개경수술

2) 교감신경간 손상

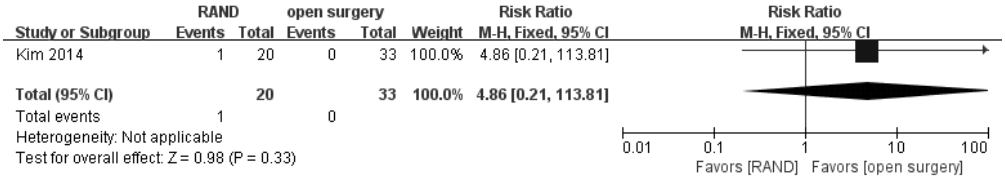


그림 168. [구강·인후두암] 교감신경간 손상 발생률: 로봇수술 vs 개경수술

3) 안면신경 하악가지 손상

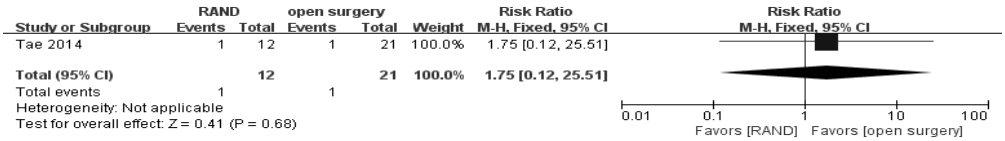


그림 169. [구강·인후두암] 안면신경 하악가지 손상 발생률: 로봇수술 vs 개경수술

4) 입꼬리 비뚤어짐

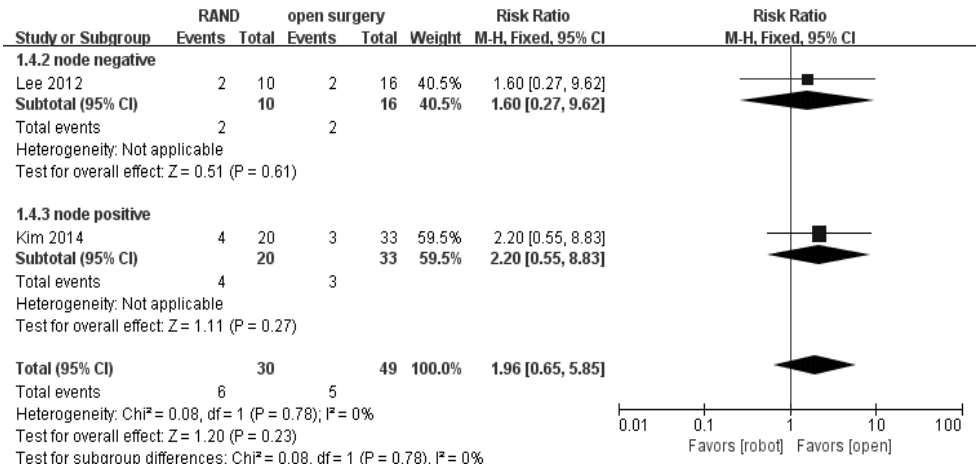


그림 170. [구강·인후두암] 입꼬리 비뚤어짐 발생률: 로봇수술 vs 개경수술

5) 귓불마비

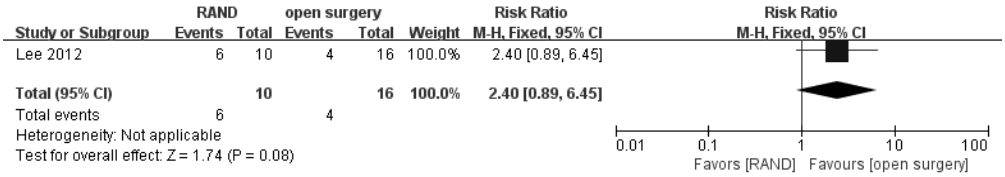


그림 171. [구강·인후두암] 귓볼마비 발생률: 로봇수술 vs 개경수술

6) 혈청종(seroma)

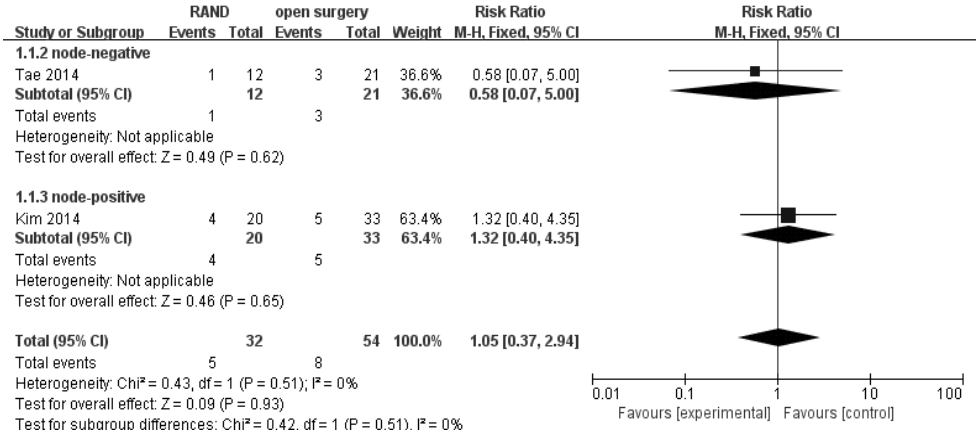


그림 172. [구강·인후두암] 혈청종 발생률: 로봇수술 vs 개경수술

7) 혈종(hematoma)

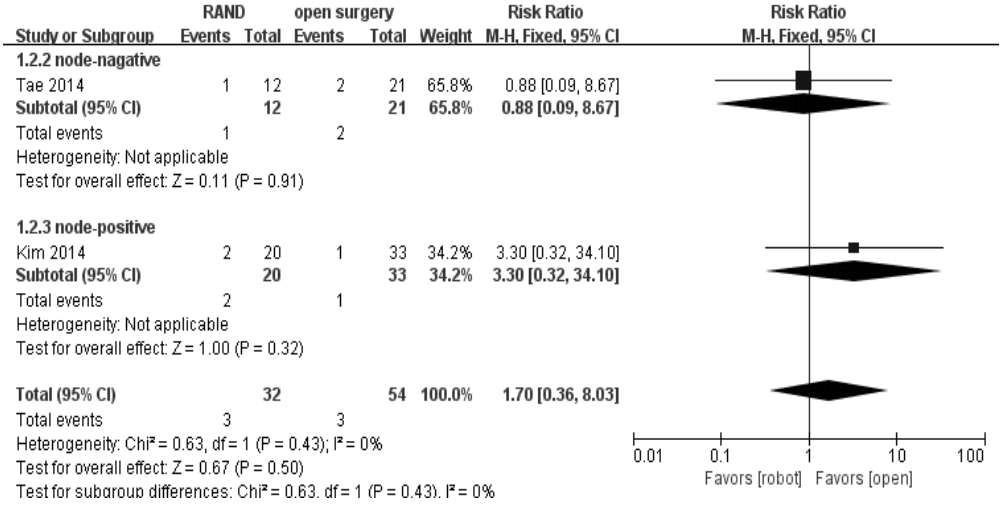


그림 173. [구강·인후두암] 혈종 발생률: 로봇수술 vs 개경수술

8) 유미누출(수술중 흉관손상)

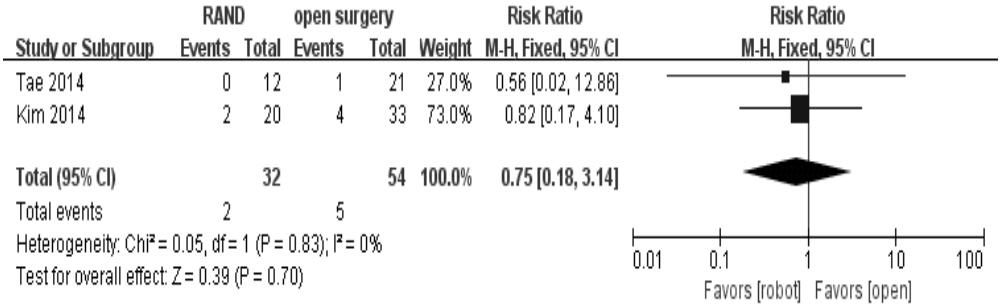


그림 174. [구강·인후두암] 유미누출 발생률: 로봇수술 vs 개경수술

9) 구강목 누공(orocervical fistula): 수술후 합병증

그림 175. [구강·인후두암] 수술후 구강목 누공 발생률: 로봇수술 vs 개경수술

10) 조직피판 괴사/열개(skin flap necrosis/dehiscence): 수술후 합병증

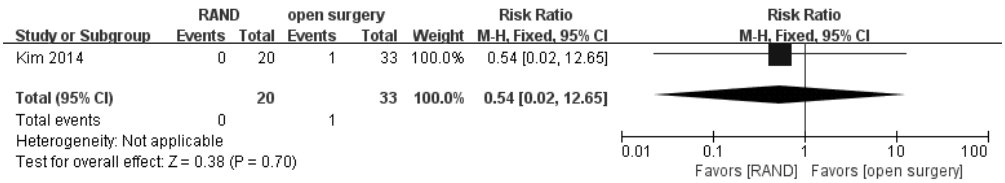


그림 176. [구강·인후두암] 수술후 조직피판 괴사/열개 발생률: 로봇수술 vs 개경수술

NECA 한국보건의료연구원
National Evidence-based Healthcare Collaborating Agency

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