A Systematic Literature Review and Meta-Analysis Comparing Robotic-Assisted Surgery Using the Da Vinci Surgical Systems for Benign Gynecological Procedures to Laparoscopic or Open Approach

INTUITIVE   PT42

Mathur M, Vaidya P, Yankovsky A, Kreaden U.S

Intuitive Surgical, Sunnyvale, CA, USA

INTRODUCTION

Robot-assisted surgery using da Vinci surgical system (dV-RAS) is seeing an increase in use for benign gynecologic conditions such as uterine fibroids, ovarian cysts, endometriosis, pelvic organ prolapse, and uterine bleeding. There is a need for a comprehensive summary of current publications to assess the value dV-RAS compared to laparoscopic (Lap) or traditional open approaches.
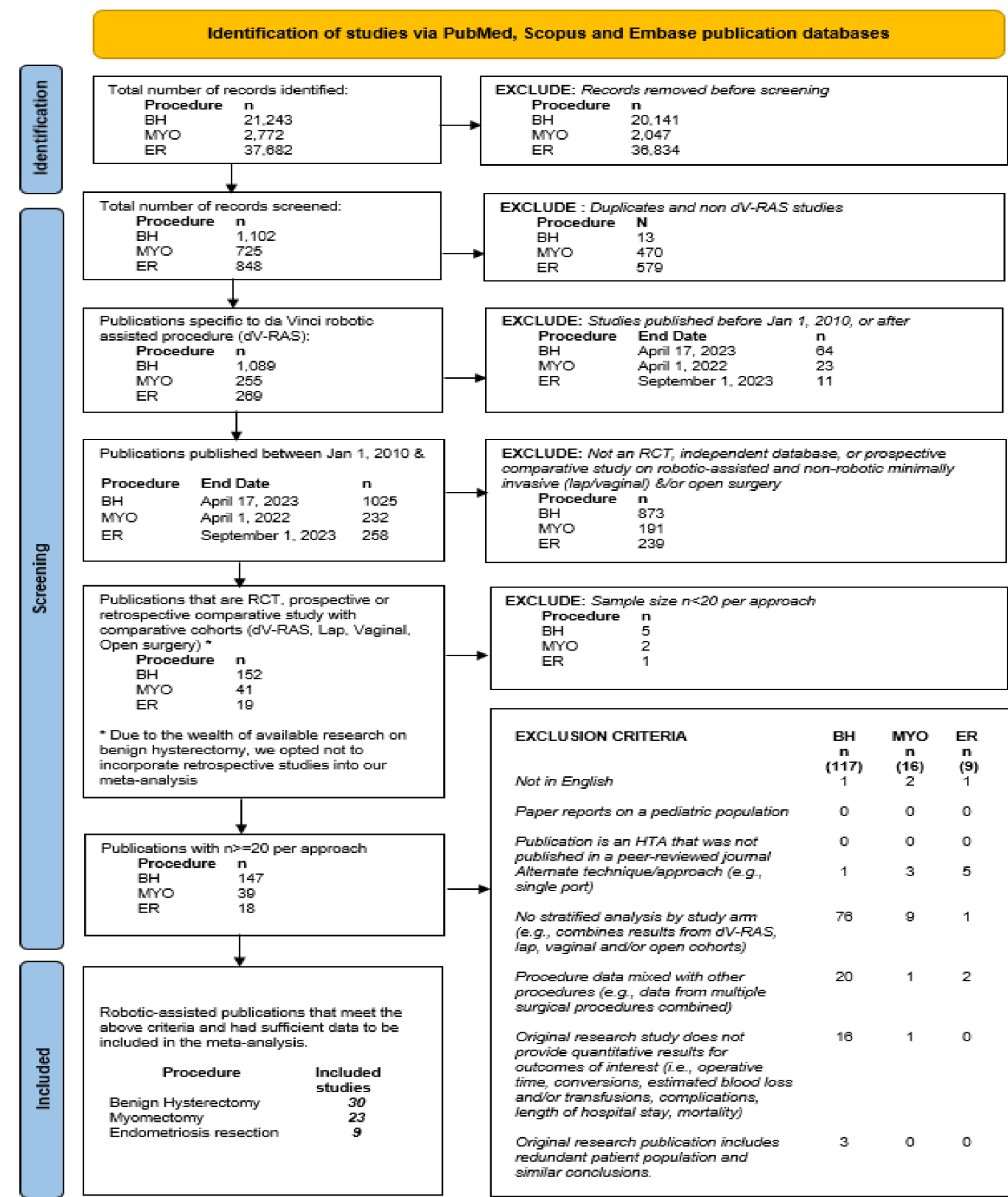
AIM

To review and synthesize the evidence across three benign gynecologic procedures to understand the results of common perioperative clinical outcomes and value of dV-RAS, presented as a meta-analysis.

METHODS

➢A Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guided literature review and R software based meta-analysis assessed studies where dV-RAS was compared to Lap or open approach in benign hysterectomy (BH), myomectomy (MYO), and endometriosis resection (ER).

➢A PubMed, Embase, and Scopus search spanning a 12-year period was performed for each procedure and screened for eligibility based on title, keywords and abstracts.

Figure 1. Study flow

RESULTS

➢The search identified 30 publications on BH, 22 on MYO, and 9 on ER.

Table 1. Comparative analysis by surgical modality for benign gynecological procedures

Outcome	Comparison	Studies	dV-RAS N	Lap/Open N	Effect size	p-value of Effect size	Heterogeneity	Model	Conclusion
Operative time (min)	dV-RAS vs LAP	BH(12), MYO(14), ER(8)	29534	93321	MD: 34.10 [21.72; 46.49]	p<0.01	p=0; I²=99%	Random	Favors LAP
	dV-RAS vs Open	BH(4), MYO(13)	22959	148115	MD: 62.56 [42.93, 82.19]	p<0.01	p<0.01; I²=99%	Random	Favors Open
Conversion to open (%)	dV-RAS vs LAP	BH(14), MYO(10), ER(6)	90056	178787	OR: 0.35 [0.24, 0.50]	p<0.01	p<0.01; I²=93%	Random	Favors RAS
	dV-RAS vs Open				Not applicable				
Estimated blood loss (ml)	dV-RAS vs LAP	BH(6), MYO(13), ER(6)	3776	3667	MD: -11.63 [-33.64; 10.38]	p=0.30	p<0.01; I²=94%	Random	No difference
	dV-RAS vs Open	BH(4), MYO(13)	2236	9268	MD: -102.90 [-163.62, -42.18]	p<0.01	p<0.01; I²=97%	Random	Favors RAS
Blood transfusions (%)	dV-RAS vs LAP	BH(11), MYO(12), ER(2)	49207	138099	OR: 0.79 [0.69, 0.91]	p<0.01	p=0.09; I²=31%	Fixed	Favors RAS
	dV-RAS vs Open	BH(5), MYO(10)	29468	155600	OR: 0.28 [0.20, 0.38]	p<0.01	p<0.01; I²=68%	Random	Favors RAS
Post-op complications 30-day (%)	dV-RAS vs LAP	BH(13), MYO(11), ER(5)	126225	196507	OR: 0.87 [0.76, 0.99]	p=0.04	p<0.01; I²=88%	Random	Favors RAS
	dV-RAS vs Open	BH(7), MYO(9)	106198	834039	OR: 0.47 [0.38, 0.59]	p<0.01	p<0.01; I²=97%	Random	Favors RAS
Length of hospital stay (days)	dV-RAS vs LAP	BH(13), MYO(11), ER(5)	44510	112699	MD: -0.08 [-0.23; 0.07]	p=0.29	p<0.01; I²=93%	Random	No difference
	dV-RAS vs Open	BH(6), MYO(13)	32392	164884	MD: -1.48 [-1.77; -1.19]	p<0.01	p=0; I²=99%	Random	Favors RAS
Readmissions 30-day (%)	dV-RAS vs LAP	BH(6), MYO(0), ER(2)	22555	36855	OR: 0.90 [0.82; 0.99]	p=0.03	p=0.07; I²=48%	Fixed	Favors RAS
	dV-RAS vs Open	BH(4), MYO(2)	22516	170233	OR: 0.94 [0.65; 1.34]	p=0.73	p<0.01; I²=89%	Random	No difference
Reoperations 30-day (%)	dV-RAS vs LAP	BH(5), MYO(3), ER(3)	14804	24635	OR: 0.92 [0.66; 1.28]	p=0.63	p=0.86; I²=0%	Fixed	No difference
	dV-RAS vs Open	BH(3), MYO(1)	14561	22212	OR: 0.45 [0.18; 1.14]	p=0.09	p<0.01; I²=85%	Random	No difference

Figure 2. Detailed Forest-plot for Conversion to open surgery
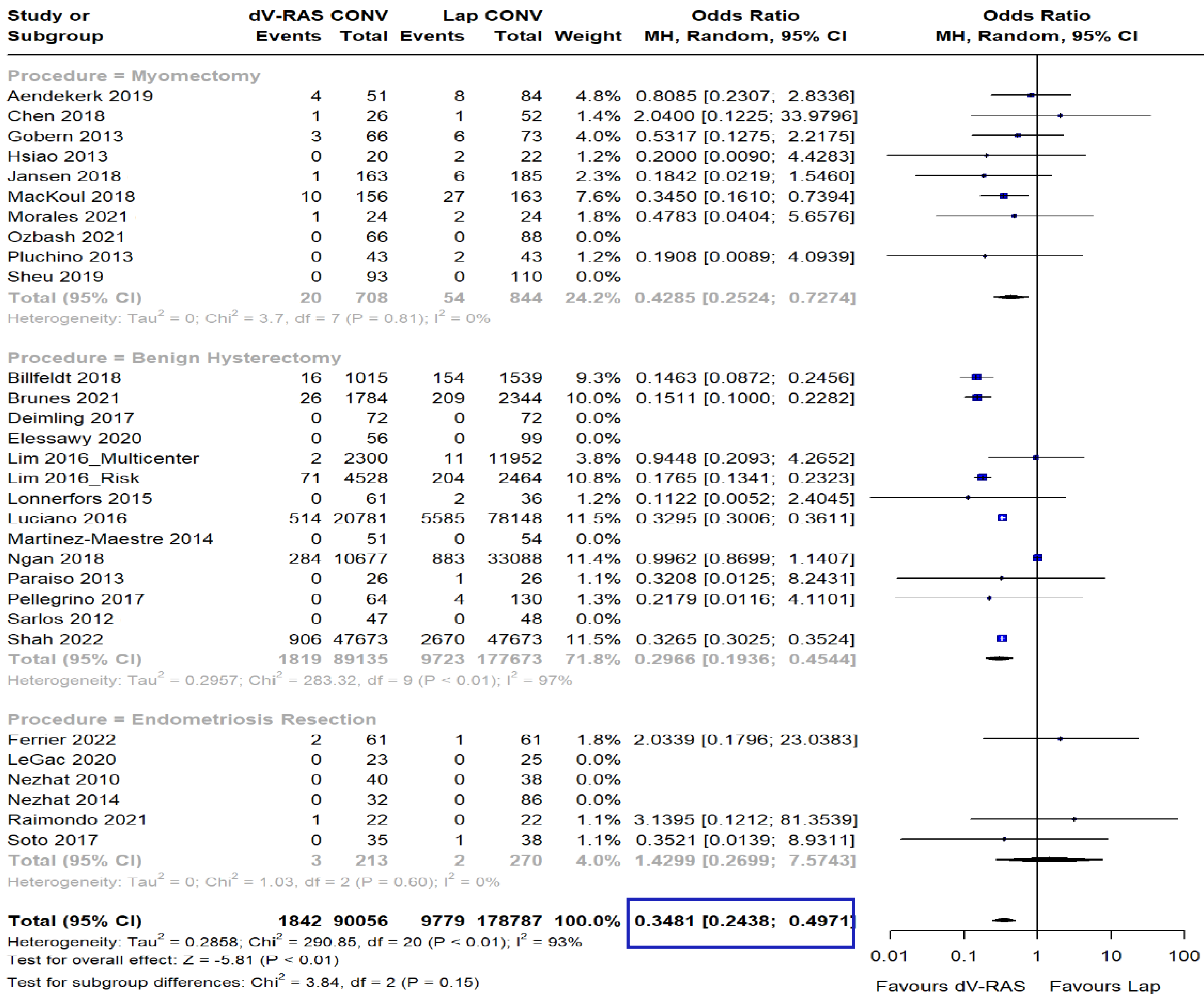
RESULTS

Compared to Lap surgery the evidence for dV-RAS benign gynecologic procedures demonstrates:

- **65%** lower likelihood of a conversion to open surgery with dV-RAS
- **21%** lower likelihood of receiving a blood transfusion with dV-RAS
- **13%** lower likelihood of experiencing a complication with dV-RAS
- Significantly longer operative time with dV-RAS by an average of **34 minutes**
- Comparable length of hospital stay, estimated blood loss, postoperative readmission and reoperation within 30-days of surgery

Compared to Open surgery the evidence for dV-RAS benign gynecologic procedures demonstrates:

- **72%** lower likelihood of receiving a blood transfusion with dV-RAS
- **53%** lower likelihood of experiencing a complication with dV-RAS
- **10%** lower likelihood of a 30-day readmission with dV-RAS
- Significantly shorter hospital length of stay by an average of **1.5 days** with dV-RAS
- Significantly less estimated blood loss with dV-RAS by an average of **103 ml**
- Significantly longer operative time with dV-RAS by an average of **62 minutes**
- Comparable rate of reoperations within 30-days of surgery

CONCLUSIONS

➢dv-RAS for benign gynecologic surgery results in lower conversion rates, fewer blood transfusions and fewer postoperative complications when compared to Lap.

➢ dv-RAS for benign gynecologic surgery results in fewer blood transfusions, less blood loss, shorter hospital stay, fewer postoperative complications and a reduction in readmissions compared to Open surgery.

➢The increase in minimally invasive surgery (MIS) is supported by the results of this meta-analysis.

➢This holistic approach to summarizing the evidence can help regulators and decision makers in evaluating dv-RAS for benign gynecologic procedures.

CONTACT

Name: Mansi Mathur
Email : mansi.mathur@intusurg.com