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What does the Pan-Asian evidence for malignant robotic-assisted procedures with da Vinci Surgical Systems say? A systematic literature review and meta-analysis

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INTRODUCTION

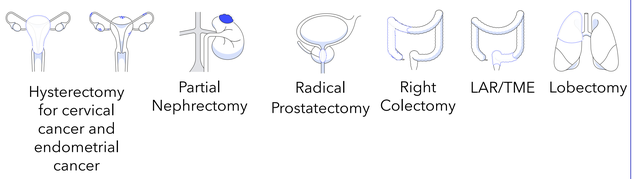
Robotic-assisted surgery with da Vinci surgical systems was introduced in Asia more than 20 years ago. A recent systematic literature review and meta-analysis, COMPARE study, highlighted the value of dV-RAS for the global population. However, payers and decision makers are interested in what the regional value of dV-RAS is compared to the standard of care.

AIM

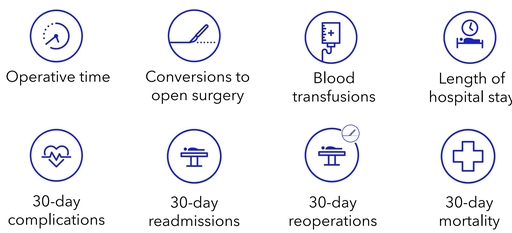
To compare the perioperative outcomes of da Vinci robotic-assisted surgery (dV-RAS) with Laparoscopic (LAP) / Video-assisted thoracoscopic (VATS) or open surgery for 7 malignant procedures in the Asian population.

METHODS

- PubMed, Scopus and EMBASE were systematically searched from 2010 to December 31, 2022 following PRISMA guidelines (PROSPERO#CRD42023466759).
- Subset analysis of the COMPARE study
- Studies published on patients from Asian countries undergoing:



- Outcomes measured:



- Data from randomized, prospective, and database studies were pooled as odds ratios (OR) or mean differences (MD) in R using fixed-effect or random-effects (heterogeneity significant).
- Bias was assessed using ROBINS-I/RoB 2 tools.

RESULTS

- **35 publications** including:
  - **10,640** patients who underwent **dV-RAS**
  - **32,457** patients who underwent **LAP/VATS**
  - **22,499** patients who underwent **open surgery**
  - **13** Randomized controlled trials
  - **14** Prospective cohort studies
  - **8** Large database studies

Figure 1. Number of included publications by country

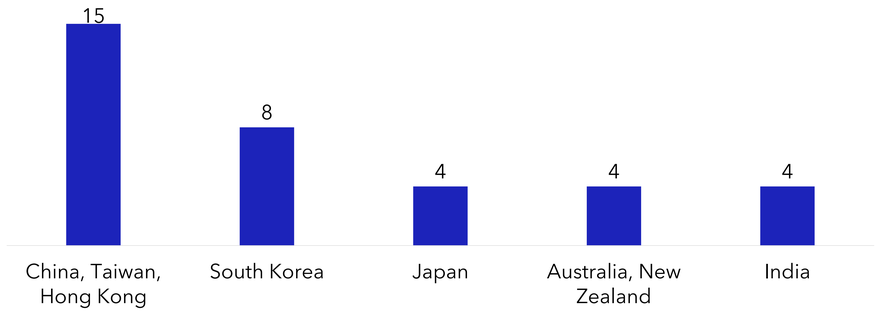


Table 1. Meta-analysis results by outcome and comparison

Outcome	Comparison	Nr. of studies	dV-RAS N	LAP/VATS Open N	Weighted effect size Mean Difference / Odds Ratio / Risk Diff. [95%CI]	Effect p-value	Heterogeneity	Model	Conclusion
Operative time (min)	dV-RAS vs LAP/VATS	15	6601	6865	MD = 22.63 [4.62, 40.64]	**0.01**	p < 0.01; I² = 98%	Random	Favors LAP/VATS
	dV-RAS vs Open	10	2904	7923	MD = 21.39 [-17.87, 60.67]	0.29	p < 0.01; I² = 99%	Random	No difference
Conversions to open (%)	dV-RAS vs LAP/VATS	14	4557	10345	OR = 0.32 [0.22, 0.45]	**<0.01**	p = 0.36; I² = 9%	Fixed	Favors dV-RAS
	dV-RAS vs Open	Not applicable							
Blood transfusions (%)	dV-RAS vs LAP/VATS	11	7751	6883	OR = 0.54 [0.31, 0.93]	**0.03**	p < 0.01; I² = 63%	Random	Favors dV-RAS
	dV-RAS vs Open	10	5185	9666	OR = 0.15 [0.07, 0.32]	**<0.01**	p < 0.01; I² = 82%	Random	Favors dV-RAS
Length of hospital stay (days)	dV-RAS vs LAP/VATS	19	8737	16612	MD = -0.81 [-1.16, -0.45]	**<0.01**	p < 0.01; I² = 90%	Random	Favors dV-RAS
	dV-RAS vs Open	14	4906	12435	MD = -2.29 [-3.17, -1.42]	**<0.01**	p < 0.01; I² = 96%	Random	Favors dV-RAS
Postoperative complications 30-days (%)	dV-RAS vs LAP/VATS	19	7252	16564	OR = 0.66 [0.52, 0.85]	**<0.01**	p < 0.01; I² = 68%	Random	Favors dV-RAS
	dV-RAS vs Open	10	3084	11170	OR = 0.43 [0.26, 0.72]	**<0.01**	p < 0.01; I² = 77%	Random	Favors dV-RAS
Reoperations 30-days (%)	dV-RAS vs LAP/VATS	8	4177	9580	OR = 0.88 [0.73, 1.07]	0.21	p = 0.69; I² = 0%	Fixed	No difference
	dV-RAS vs Open	3	251	182	OR = 0.42 [0.07, 2.52]	0.96	p = 0.54; I² = 0%	Fixed	No difference
Readmissions 30-days (%)	dV-RAS vs LAP/VATS	6	4016	9394	OR = 0.78 [0.48, 1.25]	0.30	p = 0.04; I² = 57%	Random	No difference
	dV-RAS vs Open	4	467	2258	OR = 0.53 [0.31, 0.93]	**0.03**	p = 0.52; I² = 0%	Fixed	Favors dV-RAS
Mortality 30-days (%)	dV-RAS vs LAP/VATS	13	4620	10048	OR = 0.38 [0.15, 0.92]	**0.03**	p = 0.87; I² = 0%	Fixed	Favors dV-RAS
	dV-RAS vs Open	13	50512	167635	RD = -0.003 [-0.01, 0.005]	0.42	p = 0.52; I² = 0%	Fixed	No difference

RESULTS

Compared to LAP/VATS, patients undergoing dV-RAS had:

- ↓ Operative time by **22.6 minutes**
- ↓ Conversions by **65%**
- ↓ Blood transfusions by **47%**
- ↓ Length of stay by average **0.8 days**
- ↓ 30-day postoperative complications by **34%**
- ↓ 30-day mortality by **63%**
- All other outcomes were comparable

Compared to Open, patients undergoing dV-RAS had:

- ↓ Blood transfusions by **85%**
- ↓ Length of stay by average **2.3 days**
- ↓ 30-day postoperative complications by **57%**
- ↓ 30-day readmissions by **47%**
- All other outcomes were comparable

CONCLUSIONS

- Our meta-analysis showed that dV-RAS may provide better perioperative clinical outcomes compared to LAP or open surgery in the Asian population.
- This research can help inform a regional health technology assessment. Additional research is needed to explore long-term oncological outcomes.

TABLES & REFERENCES

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