

Comparative evaluation of robot-assisted and conventional urology surgeries in India

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Abstract

There is dearth of evidence on patients' perspective, their knowledge and understanding about robot-assisted surgeries, especially in Low- and Middle-Income countries such as India. The aim of this prospective study was to analyze inpatients' and surgeon's perspectives towards robot-assisted and conventional urological surgeries. A total of 136 patients (94 robot-assisted surgery cases and 42 conventional surgery cases) were enrolled in the study. A performa (with details such as sociodemographic details of patient, patient's view point on surgery opted and doctor's perspective on advising robot-assisted or conventional surgery) was used for data collection. Of 136 patients, 135 (99.3%) responded that their reason for opting the surgery (either robot-assisted or open laparoscopy) depended on the advice provided by the surgeon. 78 (83.3%) patients mentioned they opted for robot-assisted surgeries because of aesthetics (cosmetically better) in comparison to 07 (16.7%) patients who opted for conventional surgeries. Only 1.1% of surgeons reported robot-assisted surgeries to be technically easy. A few surgeons (1.1%) who operated with robot-assisted surgeries mentioned it to be time-consuming than 71.4% (30) surgeons in open/lap group. All the surgeons who treated patients with robot-assisted surgeries mentioned to have no of complications in comparison to 35.75% surgeons in open/lap group. The reason for choosing robot-assisted surgeries among both patients and surgeons were patient's compatibility, cosmetically better, less-time consuming and less hospital stay. In addition, the surgeons also believed the robot-assisted surgeries to have fewer complications for their patients and therefore, recommended it.

Introduction

The introduction of minimally invasive robot-assisted surgeries for various surgical procedures, especially urological procedures, have gained wide popularity in recent times.[1] It has been reported that approximately 205,000 procedures were performed by using the robot-assisted surgical system in year 2009, as compared to only 20,000 in 2004 and 1500 procedures in the year 2000.[2] These numbers are increasing rapidly in the current times with an adoption rate of 25% every year for robot-assisted surgeries.[3]

The desire and motivation for developing surgical robots came with the intention of overcoming the demerits of laparoscopic techniques and further to expand the advantages provided by minimally invasive surgery.[4] Robot-assisted surgery is actually performed in a similar way as laparoscopic surgery in lieu of the fact that it also uses small incisions for the introduction of special type of instrument with increased degree of precision.[4] The surgeon who comfortably sits on an operating console is able to see a very clear 3-D view of the surgical site, while he control the arms of the robot holding the special instrument together with the camera and scope.[4,5] This ergonomic position has proved to relieve the physical and mental stress among operating surgeons and allowed them to remain more focused and perform better quality surgery. Even during the COVID-19 pandemic, latest evidence shows that doctors' experience of managing cases with robot-assisted surgeries have proven to be successful and encouraging.[6]

In addition, a study conducted by the U.S FDA also found that surgeons, who were experienced with da Vinci Surgical System, believed that their patients operated with robot assistance had less bleeding, very few complications, faster and quicker recovery times and shorter length of stay in the hospital.[7,8] Surgeons also expressed the usefulness of robot-assisted surgeries in eliminating hand tremor, enhanced visualization, increased precision, better dexterity and control.[7,8] Some surgeons describe low patient volume as one of the major barrier which hamper their experience and skills.[9,10] Nonetheless, skilled surgical staff require on-demand technical support and costly equipment through hospital support to alleviate the success rate of robot-assisted surgeries.[8]

Contrastingly, evidence shows that patients require more information and knowledge when it comes to decision-making options for choosing between conventional and robot-assisted surgeries.[11,12] Patients in past have expressed their concerns in relation to safety with respect to robot-assisted surgeries.[11] However, in a study conducted in Australia, the patients who underwent robot-assisted surgeries were overall “very satisfied”.[12]

While there is mixed literature on doctors’ perspectives, there is dearth of evidence on patients’ perspective, their knowledge and understanding in literature about robot-assisted surgeries. Research highlights that financial factors to be major reason for slow growth of robot-assisted surgeries in LMICs, such as India.[13– 15] India got its first urological robotic installation at the All India Institute of Medical Sciences (AIIMS), New Delhi, following which the growth of robotic surgery has been progressing slowly in India. The aim of this study was to analyze patient’s and doctor’s view point towards robot-assisted and conventional surgeries in India. The study was conducted in department of urology in Post-Graduate Institute of Medical Education and Research (PGIMER), Chandigarh - a tertiary care hospital which caters to Northern states of India.

Methods

Study Design

This is a prospective study that was conducted in Advanced Urology Centre (AUC), located at 2nd Floor, B-Block, Nehru Hospital, PGIMER, Chandigarh. This study was conducted over a period of 12 months from January, 2017 to December, 2017.

Scheduled Operation Theatre lists of the Robotic Centre OT and Main OT Complex, 4th Floor Nehru Hospital were screened prior to the day of the surgery and patients scheduled for surgeries were recruited after receiving their informed written consent. However, patients who refused to participate were excluded from the study. Cases recruited for robot-assisted surgeries were allocated to Group-01 and conventional surgeries (open/laparoscopic) (controls) were placed in study Group-02.

Sample Size: Sample size of 50 cases for each study group was calculated with the help of Epi-Info software, considering the population of 200 cases of Robot-assisted surgeries done half yearly, at confidence interval of 5% and 95%.

A performa was used for data collection from patients and their treating surgeons. The Performa included details such as socio-demographic details about the patient (age, sex, educational qualification etc.); patient's view point on surgery opted; doctor's perspective on advising/choosing robot-assisted or conventional surgeries were recorded. *Performa used for data collection is attached as Supplementary file*).

The Performa was filled after discussing the cases with the treating surgeons and thereafter their opinions were recorded in an approved data collection Performa. It took approximately 8–10 minutes to discuss and record the perspective of the treating surgeon regarding each patient.

- Inclusion Criteria
- Patients undergoing comparable surgeries and consented to participate were included.

Exclusion Criteria

- Refusal to participate in the Study.
- Uro-surgeries which were done by only one of the different surgical treatment modalities available were excluded from the study as they were not fulfilling the criteria of comparison.

Surgical Skills of the Operating Surgeons

All Urologists employed in Advance Urology Centre (AUC), 2nd Floor B-Block, Nehru Hospital, PGIMER were working as full-time permanent teaching Faculty in the Department and were well trained in both robot-assisted surgeries as well as conventional surgeries and had more than two years of operating experience in robot-assisted surgeries and more than five years of operating experience in Laparoscopic and Open surgeries. PGIMER is Government Funded Deemed Medical University of National repute under the Union Ministry of Health and Family Welfare, Government of India.

Ethics

All the Administrative permissions as well as ethical clearance were obtained from the institute's Ethics committee to carry out this study (Study ID Code/Ethical Clearance No. INT/IEC/2017/116; Dated: 23-02-2017). Informed written consent was taken from all the recruited participants in the study.

Data analysis

Data collected on patient's view point and Surgeon's perspective regarding Robot-assisted surgeries and Conventional surgeries was entered in Microsoft Excel and a Master data sheet was prepared. Microsoft Excel and Statistical Package for Social Sciences (SPSS) were used for statistical analysis. Continuous variables were evaluated as mean, standard deviation (SD). Categorical variables were compared by using chi-square test and continuous variables were compared by using t-test.

Results

A total of 136 patients (94 robot-assisted surgery and 42 conventional surgery cases) participated in the study. (Table 1). Out of Total 136 patients in the study population, 102 (75%) were Male and 34(25%) were Female. Among 102 Male patients, 70 were operated by Robot-assisted surgical procedures and 32 were operated by conventional (open/laparoscopic) surgical procedure and out of 34 female patients 24 were operated by Robot-assisted procedures and 10 were operated by Conventional procedures. Overall the representation of Male was greater than Female in both the study groups However, there was no reasonably significant Gender differences between the Two Groups (p value = .396)

[INSERT TABLE 1]

Out of 94 patients who underwent robot-assisted surgeries 92 (97.9%) opted/chosen robotic surgery and only 02 (2.1%) had opted/chosen conventional surgeries and were treated by robot-assisted surgeries. In case of conventional surgeries, among 42 patients who were operated by conventional methods 36(85.7%) opted/chosen conventional surgeries and 06 (14.3%) patients had opted robot-assisted surgeries but were treated by conventional methods due to various surgical and non-surgical reasons like patient's economic status, unfit for robot-assisted surgery as decided/advised by the treating surgeons based on general conditions of the patient and associated co-morbidities, a few patients who opted for Robot-assisted surgeries were considered for conventional surgeries based on the pre-anesthetic evaluations by anesthesia team and were declared unfit, some opted for Robot-assisted surgeries but later changed their minds and decided to undergo treatment by conventional surgical methods and expressed that they had less confidence in newer surgical techniques like Robot-assisted surgeries and we as a patient has not heard and known much about this surgical modality, so finally conveyed their treating surgeons to treat them by conventional methods.

Of 136 patients recruited in the study, 135 (99.3%) patients responded that the surgery (either robot-assisted or open/laparoscopy) was advised/suggested by the treating surgeon (Table-2). In addition, 78 (83.3%) patients mentioned to opt for robot-assisted surgeries because of aesthetics (cosmetically better) in comparison to only 07 (16.7%) who opted for conventional surgeries for cosmetic reasons. Moreover, 72 (76.6%) patients in robot-assisted surgery group expressed that they were told by their doctors about shorter hospital stay in robot-assisted surgeries whereas only 08(19.0%) of patients in open/lap group responded that hospital stay was informed to be shorter. As far as the cost of surgery is concerned only, 03 (03.2%) patients responded that robot-assisted surgery is less costly whereas in case of open/lap group 32 (76.2%) responded that they were informed by the surgeon that this surgery is less costly. (Table-2)

[INSERT TABLE 2]

In robot-assisted group of 94 patients, the surgeons responded that only 03(03.2%) patients were not fit for conventional (open/ lap), so were treated by robot-assisted modality where as in case of open/lap group 30 (71.4%) out of total 42 patients were not fit for robot-assisted surgeries, so were treated by open/lap techniques. Additionally, 57 (60%) surgeons considered robot-assisted surgeries to have cosmetically better outcomes than open/lap group whereas only 06 (14.3%) surgeons mentioned

conventional surgeries to be cosmetically better. (Table-3) The response rate of doctors regarding better postoperative results/outcomes of robot-assisted surgery was 100% for robot-assisted group whereas in case of open/lap group the response rate was 23.8%. (Table-3)

[INSERT TABLE 3]

As far as the reasons for choosing either robot-assisted or open/lap surgeries by the surgeons is concerned, it was observed that in case of robot-assisted surgeries response about being technically easy was 01.1% whereas in case of open/lap surgeries response of being technically easy was 85.7%(Table-4). Only 1.1% (01) of surgeons who operated with robot-assisted surgeries mentioned it to be time-consuming than 71.4% (30) surgeons in open/lap group. All the surgeons who treated patients with robot-assisted surgeries mentioned that there are less no of complications with robot-assisted surgeries whereas 35.75% surgeons in open/lap group expressed that there are fewer complications with conventional methods (Table-4)

[INSERT TABLE 4]

Discussion

The study revealed that, overall in a study population of 136 patients, 135 (99.3%) responded that the surgery (whether robot-assisted or conventional) was advised/suggested to them by the treating surgeon. In fact, 93 (98.9%) out of a total of 94 patients who underwent robot-assisted surgeries mentioned that they were advised to go for robot-assisted surgery by their surgeons. Similarly, patients who opted/chosen this surgical treatment modality were of the view, that they were advised/suggested to be treated by this modality of surgery by their treating doctor. In this study, it has been found that out of 94 patients in robot-assisted group, the surgeons responded that only 03(03.2%) patients were not fit for conventional (open/lap.), so were treated by robot-assisted modality where as in case of conventional (open/lap.) group 30 (71.4%) out of total 42 patients were not fit for robot-assisted surgeries, so were treated by open/lap. techniques.

Previous studies conducted in other countries have also shown that surgeons who were experienced with Da Vinci surgical system for performing robot-assisted surgeries believed that patients undergoing robot-assisted surgery have less bleeding, very few complications, faster and quicker recovery times and shorter length of stay in the hospital.[16,17] Doctors have mentioned in past that robot-assisted surgeries improve depth perception by providing the surgeons 3-D vision, as compared with the two-dimensional vision being provided normally during endoscopic procedures and is therefore, preferred by them.[18] In addition, when compared with the long instruments being used in endoscopy, robotic surgical systems use very small size instruments that provide for increased range of motion.[19] Such range of motion is very helpful while doing procedures on pediatric patients.[19,20] Even in this study response rate of doctors regarding better post-operative results/outcomes of robot-assisted surgeries was 100% (94) for robot-assisted group whereas; in case of conventional (open/lap.) group the response, rate was 23.8% (10).

Nonetheless, primary care physicians need to be aware about new technological advancements so that they can guide their patients for best surgical technique. As far as, the reasons for opting/choosing either robot-assisted or conventional (open/lap. surgeries by the surgeons is concerned, this study revealed that in case of robot-assisted surgeries response rate regarding technical easiness was 01.1% (01) which thereby means most of the surgeons felt that technically robot-assisted surgeries were not easy for the time being. It is because robot-assisted surgeries are relatively new to most of the Indian surgeons. However, with increasing experience and wider use of robot-assisted technology it will become technically easier. Moreover, Indians surgeons consider conventional surgeries technically easy than robot-assisted surgeries because of the fact that surgeons are more exposed to the conventional techniques, volume of robot-assisted surgeries and number of Robotic surgical centers is quite less in India that prolongs the learning curve.

Further, the results of this study highlighted that 78(83.0%) out of total 94 patients treated by robot-assisted surgeries told that, their treating surgeon advised them it would be cosmetically better. The results of this study also ascertained that surgeon's response rate regarding cosmetically better outcomes of robot- assisted surgeries was (60%; n = 57) and in case of open/lap group was (14.3%; n = 6). This is in line with the literature where it has demonstrated that robot assisted surgeries have advantage in terms of body image, self-esteem and cosmetic outcomes over the conventional approach.[21] Scarring after surgery has been shown negatively affect self-esteem of the patient, which can lead to psychological trauma to patient during post-operative period.[21,22] Studies have shown that patients concerning their appearance, in addition to their satisfaction level (related to body image self-esteem and anxiety pre and after the surgery) was worse in patients who had undergone conventional/open surgery in comparison to patients who underwent robot-assisted surgeries.[23] Therefore, both surgeons and patients prefer robot-assisted surgeries (which are minimally invasive).

The findings of this study ascertained that (76.6%) patients in robot-assisted group expressed that they were told about shorter hospital stay in robot-assisted surgeries. For 25.5% (n = 24) patients in robot-assisted group, surgeons said they were financially sound, whereas in case of conventional (open/lap.) group the response rate that the patients were financially sound was 23.8% (n = 10). In fact, patients undergoing open/lap. group 32 patients (76.2%) responded that they were informed by their treating surgeons that this type of surgery would be less costly for them. Operative cost of robot-assisted surgeries is high because of added expense of specialized equipment used during the surgery. However, reduced inpatient hospital stay for robot-assisted surgery patients have shown to overall allow cost savings.[24]

Limitations

This study was undertaken by a single investigator in a limited time frame, so the sample size was small. However, patient's and doctor's perspectives on choosing robot-assisted surgeries in comparison to conventional surgery are well documented in the study.

Conclusion

The reason for choosing robot-assisted surgeries among both patients and surgeons were patient's compatibility, cosmetically better, less-time consuming and less hospital stay. In addition, the surgeons also believed the robot-assisted surgeries to have fewer complications for their patients and therefore, recommended it. This study may help strengthening gaps between the knowledge of surgeons and patients for opting robot-assisted surgeries world-wide.

Declarations

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Conflicts of interest/Competing interests: None

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Tables

Table-1: showing surgeries opted/chosen by the patients.

Group		Robot-assisted (G-01)	Conventional (Open/lap) (G-02)	Total
Surgery opted/chosen	Robot-assisted	92 (97.9%)	06 (14.3%)	98 (72.1%)
	Conventional (Open/Lap.)	02 (2.1%)	36 (85.7%)	38 (27.9%)
	Total	94 (100%)	42 (100%)	136 (100%)

Table-2: Reasons for opting either Robot-assisted or conventional (open/laparoscopic) surgeries by the patients

Group		Robot-assisted (G-01)	Conventional (Open/lap) (G-02)	Sub Total	Total
Surgeon advised/suggested	Yes	93 (98.9%)	42 (100%)	135(99.3%)	136(100%)
	No response	01 (01.01%)	00 (0.0%)	01 (0.7%)	
Cosmetically better	Yes	78 (83.0%)	07 (16.7%)	85 (62.5%)	136(100%)
	No response	16 (17.0%)	35 (83.3%)	51 (37.5%)	
Length of stay is short	Yes	72 (76.6%)	08(19.0%)	80 (58.8%)	136(100%)
	No response	22 (23.4%)	34 (81.0%)	56 (41.2%)	
Cost of surgery is less	Yes	03 (03.2%)	32 (76.2%)	35 (25.7%)	136(100%)
	No response	91 (96.8%)	10 (23.8%)	101(74.3%)	
Total		94 (69.1%)	42 (30.9%)	136 (100%)	136(100%)

Table-3: Reasons for suggesting either Robot-assisted or Conventional surgeries to the patients

Group		Robot-assisted (G-01)	Open/Lap (G-02)	Sub Total	Total
Patient not fit for other surgery	Yes	03 (03.2%)	30 (71.4%)	33 (24.3%)	136(100%)
	No	91 (98.6%)	12 (28.6%)	103(75.7%)	
Cosmetically better	Yes	57 (60.6%)	06 (14.3%)	63(46.3%)	136(100%)
	No	37 (39.4%)	36 (85.7%)	73(53.7%)	
Patient is financially sound	Yes	24 (25.5%)	10 (23.8%)	34(25.0%)	136(100%)
	No	70 (74.5%)	32 (76.2%)	102(75.0%)	
Better postoperative results/outcomes	Yes	94 (100.0%)	10 (23.8%)	104(76.4%)	136(100%)
	No	00 (0.0%)	32 (76.2%)	23.5%)	

Table-4: Table showing Reasons for opting/choosing either Robot-assisted or Conventional surgeries by the surgeons.

Group		Robot-assisted (G-01)	Open/lap.(G-02)	Sub Total	Total
Technically easy	Yes	01 (01.1%)	36 (85.7%)	37(27.2%)	136(100%)
	No	93 (98.9%)	06 (14.3%)	99(72.8%)	
Patients' choice	Yes	35 (37.2%)	07 (16.7%)	42(30.9%)	136(100%)
	No	59 (62.8%)	35 (83.3%)	94(69.1%)	
Less time consuming	Yes	01 (01.1%)	30 (71.4%)	31(22.8%)	136(100%)
	No	93 (98.9%)	12 (28.6%)	105(77.2%)	
Less no. of complications	Yes	94 (100.0%)	15 (35.7%)	109(80.1%)	136(100%)
	No	00 (0.0%)	27 (64.3%)	27(19.9%)	

Supplementary Files

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