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A RETROSPECTIVE OBSERVATIONAL STUDY OF LAPAROSCOPIC VERSUS ROBOTIC ADRENALECTOMY FOR ADRENAL TUMOURS

Urology

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ABSTRACT

Incidence of adrenal tumours is reported to be approximately 1.5 to 9.0% 1. Nearly 10% of adrenal tumours are functional, and an approximately less than 5% are malignant. Laparoscopic adrenalectomy was first described by Gagner in 1992 [2]. It has the advantages such as less haemorrhage, shorter hospital stay, minimally invasive incision [3,4,5]. However, limitations include two dimensional vision, instability of camera vision, poorer ergonomics, and stiffness of tools, and these have been improved by the robotic surgery. Robot-assisted adrenalectomy is a recent addition, showing advantages of three-dimensional optics, magnified view, superb resolution, good depth perception, elimination of tremor, precise movements and fully articulating instruments 6, 7. The aim of this study is to compare and report the perioperative outcomes of robot-assisted adrenalectomy and conventional laparoscopic adrenalectomy. To our knowledge, this is the first study comparing robotic versus laparoscopic resection of adrenal tumours in east zone of India. **MATERIALS AND METHODS:** Retrospective observational study of all the patients of adrenal tumours who underwent laparoscopic or robotic adrenalectomy in our Urology department from January 2021 to December 2023. Sample size was according to the recorded data available. Inclusion Criteria included all the patients with adrenal tumours who visited the urology department. Exclusion criteria included paediatric patients, patients who underwent open adrenalectomy and locally advanced or widely metastatic disease. Statistical analysis data were analysed by SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and Graph Pad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two-sample t-tests for a difference in mean involved independent samples or unpaired samples. Paired t-tests were a form of blocking and had greater power than unpaired tests. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate. P-value ≤ 0.05 was considered statistically significant. **RESULTS:** A total of 33 patients were retrospectively studied, and the following statistically significant results were observed. Majority number of [10 (71.4%)] patients had Right Laterality in Laparoscopic compared to Robotic [13 (68.4%) had left laterality]. Operative time (minutes) was higher in Laparoscopic [109 minutes] compared to Robotic [84 minutes]. 4 patients had Open conversion in Laparoscopic adrenalectomy. Only 1 patient had Clavien 1, and 3 patients had Clavien 2 in Laparoscopic adrenalectomy No complications in Robotic Adrenalectomy. Hospital stay (days) was more in Laparoscopic [2.6429 ± .9288] compared to Robotic adrenalectomy. [2.0526 ± .2294] **CONCLUSION:** Operative time and post operative hospital stay were both comparatively less in robotic adrenalectomy, indicating it to be more efficacious than laparoscopy. Laparoscopic group showed Clavien 1 scale of postoperative complication in 1 patient, and of Clavien 2 scale in 3 patients, with no post operative complications in robotic group showing superior safety profile in robotic group. In conclusion, Robotic group can be considered to be more efficacious and safer for adrenalectomy in this group of patients.

KEYWORDS

Robotic Adrenalectomy, Laparoscopic Adrenalectomy, Adrenal tumour, Clavien scale, Safety, Efficacy

INTRODUCTION

Incidence of adrenal tumors is reported to be approximately 1.5 to 9.0% 1. Nearly 10% of adrenal tumors are functional, and an approximately less than 5% are malignant. Laparoscopic adrenalectomy was first described by Gagner in 1992 2. At present, it has replaced the open procedure as the standard of care and safer treatment modality for most adrenal tumors, with the advantages of less haemorrhage, short hospital stays, and minimally invasive incision 3,4,5. However, LA may become a challenging surgery such as in case of large adrenal masses, when lymph node dissection is needed or in obese patients. Two dimensional vision, the chances of instability of camera vision, poorer ergonomics when compared to robotic, and tool stifness are some of the limitations of laparoscopic surgery that have been improved upon by the robotic surgery coming into the picture 6,7. Conventional laparoscopic adrenalectomy is performed by a transperitoneal laparoscopic (TLA) or retroperitoneal laparoscopic (RLA) approach in general. TLA suites all sizes of tumors as it has a large operating space, while RLA is more of a direct approach to the targeted adrenal gland, eliminating the dissection of adjacent structures. Laparoscopy also is associated with a prolonged and steep learning curve , given for the nonarticulated instruments and inefficient force transmission [9].

Robot-assisted adrenalectomy (RA) is the recent addition, having the advantages of three-dimensional optics, magnified view with excellent resolution, good depth perception, elimination of tremor, movements with precision and excellently articulating instruments [6,7]. It also helps the surgeon to operate being in a comfortable and relaxed position. These are few advantages which could theoretically cause improved peri-operative outcomes. However, it has often been quite often criticized for the long operating time and high cost compared with laparoscopic approach [8].

Horgan and Vanuno reported first robotic adrenalectomy in 2001 9.

The aim of this study is to compare and report the perioperative outcomes of robot-assisted TLA (RATLA) and conventional laparoscopic adrenalectomy in a single centre.

To our knowledge, this is the first study comparing robotic versus laparoscopic resection of adrenal tumors in east zone.

MATERIALS AND METHODS:

Retrospective observational study of all the patients of adrenal tumours who underwent laparoscopic or robotic adrenalectomy in our Urology department of Apollo Multi-speciality hospital Kolkata from January 2021 to December 2023. Sample size was according to the recorded data available. Inclusion Criteria included all the patients with adrenal tumours who visited the urology department. Exclusion criteria included paediatric patients, patients who underwent open adrenalectomy and locally advanced or widely metastatic disease.

Statistical analysis data were analysed by SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and Graph Pad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two-sample t-tests for a difference in mean involved independent samples or unpaired samples. Paired t-tests were a form of blocking and had greater power than unpaired tests. Unpaired proportions were

compared by Chi-square test or Fischer's exact test, as appropriate. P-value ≤ 0.05 was considered statistically significant.

FIGURES-

Figure 1: Distribution of Laterality

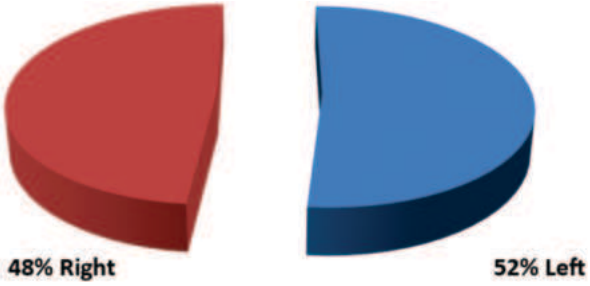


Figure 2: Distribution of Surgical approach

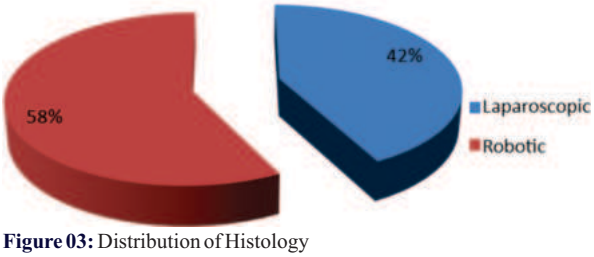


Figure 03: Distribution of Histology

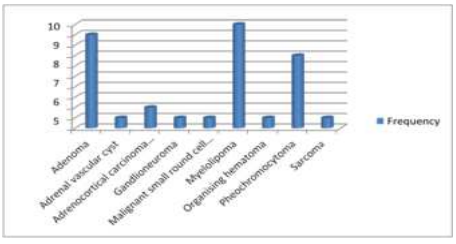


Figure 04: Distribution of mean Hospital stay (days): Surgical approach

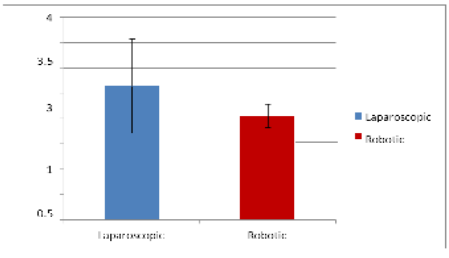


Figure 05: Association between Open conversion: Surgical approach

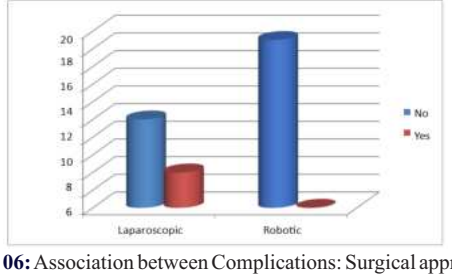
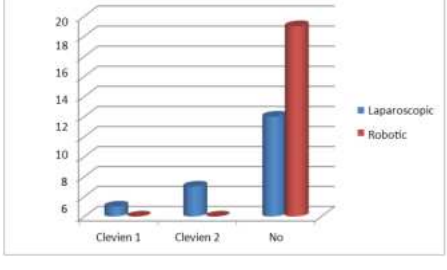


Figure 06: Association between Complications: Surgical approach



TABLES

Table 1: Distribution of Open conversion

Open conversion	Frequency	Percent
No	29	87.9%
Yes	4	12.1%
Total	33	100.0%

Table 2: Distribution of Complications

Complications	Frequency	Percent
Clevien 1	1	3.0%
Clevien 2	3	9.1%
No	29	87.9%
Total	33	100.0%

Table 3: Distribution of Readmission

Readmission	Frequency	Percent
No	33	100.0%
Total	33	100.0%

Table 4: Distribution of Mortality

Mortality	Frequency	Percent
No	33	100.0%
Total	33	100.0%

Table 5: Association between Operative time: Surgical approach

SURGICAL APPROACH			
Operative time group	Laparoscopic	Robotic	TOTAL
60-90	6	13	19
Row %	31.6	68.4	100.0
Col %	42.9	68.4	57.6
91-120	4	6	10
Row %	40.0	60.0	100.0
Col %	28.6	31.6	30.3
121-150	4	0	4
Row %	100.0	0.0	100.0
Col %	28.6	0.0	12.1
TOTAL	14	19	33
Row %	42.4	57.6	100.0
Col %	100.0	100.0	100.0

Table 6: Association between Laterality: Surgical approach

Surgical Approach			
Laterality	Laparoscopic	Robotic	Total
Left	4	13	17
Row %	23.5	76.5	100.0
Col %	28.6	68.4	51.5
Right	10	6	16
Row %	62.5	37.5	100.0
Col %	71.4	31.6	48.5
Total	14	19	33
Row %	42.4	57.6	100.0
Col %	100.0	100.0	100.0

RESULTS:

In our study, 8 (24.2%) patients were ≤40 years of age, 8 (24.2%) patients were 41-50 years of age, 8 (24.2%) patient were 51-60 years of age and 9 (27.3%) patients were ≥61 years of age. In our study, 22 (66.7%) patients were Female and 11 (33.3%) patients were male. In our study, 3 (9.1%) patients had Tumor size (<2cm), 9 (27.3%) patients had Tumor size (2 to 4cm), 7 (21.2%) patients had Tumor size (4 to 6cm), 10 (30.3%) patients had Tumor size (6 to 8cm), 3 (9.1%) patients had Tumor size (8 to 10cm) and 1 (3.0%) patient had Tumor size (>11cm). In our study, 17 (51.5%) patients had Left Laterality and 16 (48.5%) patients had Right Laterality as shown in Figure 1. In our study, 8 (24.2%) patients had been previous abdominal surgery. In our study, 14 (42.4%) patients had Laparoscopic surgery and 19 (57.6%) patients had Robotic surgery as shown in Figure 2. In our study, 19 (57.6%) patients had Operative time 60-90 minutes, 10 (30.3%) patients had Operative time 91-120 minutes and 4 (12.1%) patients had Operative time 121-150 minutes . In our study, 4 (12.1%) patients had Open conversion as shown in Table 1. In our study, 1 (3.0%) patient had Clevien 1 and 3 (9.1%) patients had Clevien 2 as shown in Table 2. In our study, 9 (27.3%) patients had Adenoma, 2 (6.1%) patients had Adrenocortical carcinoma (high grade), 10 (30.3%) patients had Myelolipoma and 7 (21.2%) patients had Pheochromocytoma as shown in Figure 3. In our study, there was no Re- admission (Table 3)

and no mortality (Table 4). In Laparoscopic, the mean Hospital stay (days) (mean± s.d.) of patients was 2.6429 ± .9288. In Robotic, the mean Hospital stay (days) (mean± s.d.) of patients was 2.0526 ± .2294 as shown in Figure 4. In Laparoscopic, 6 (42.9%) patients had Operative time 60-90, 4 (28.6%) patients had Operative time 91-120 and 4 (28.6%) patients had Operative time 121-150. In Robotic, 13 (68.4%) patients had Operative time 60-90 and 6 (31.6%) patients had Operative time 121-150. Association of Operative time group with Surgical approach was statistically significant (p=0.0414) as shown in Table 5. In Laparoscopic, 4 (28.6%) patients had Left Laterality and 10 (71.4%) patients had Right Laterality. In Robotic, 13 (68.4%) patients had Left Laterality and 6 (31.6%) patients had Right Laterality. Association of Laterality with Surgical approach was statistically significant (p=0.0235) as shown in Table 6. In Laparoscopic, 4 (28.6%) patients had Open conversion. Association of Open Conversion with Surgical approach was statistically significant (p=0.0129) as shown in Figure 05. In Laparoscopic, 1 (3.0%) patient had Clavien 1 and 3 (9.1%) patients had Clavien 2. There was no surgical complications associated with robotic surgery. Association of Complications with Surgical approach was statistically significant (p=0.0456) as shown in Figure 06.

DISCUSSION

Pineda et al [14], Mishra et al [17], Samreen et al study [18]: conducted a study which showed no significant differences between groups with respect to demographic variables like age and sex and BMI. It was found that, Tumor size (cm) was most in Laparoscopic [5.5143 ± 2.4980] compared to Robotic [5.4184 ± 2.6429] but this was not statistically significant (p=0.9168). Present study showed that, majority number of [10 (71.4%)] patients had Right Laterality in Laparoscopic compared to Robotic [13 (68.4%) had left laterality] but this was statistically significant (p=0.0235)

Mishra et al study [17] concluded that laparoscopic and robotic group didn't show any significant difference in terms of Tumor size and laterality. Agrusa et al [21] conducted study among 798 patients: 379 underwent robotic adrenalectomy (cases group) and 419 to laparoscopic adrenalectomy (controls group). There were no significant differences between the two groups of patients respect to age, gender, laterality and Tumor size. Our study, higher number of [4 (28.6%)] patients had Previous abdominal surgery in Laparoscopic compared to Robotic [4 (21.1%)] but this was not statistically significant (p=0.6184). We examined that; Operative time (mins) was higher in Laparoscopic [109 minutes] compared to Robotic [84 minutes] and this was statistically significant (p=00095). Young et al [15] concluded that the mean operative time was longer in the robotic group. Agrusa et al [21] demonstrated lower operative time for laparoscopic group but there were no significant differences with robotic group.We examined that, only 4 patients had Open conversion in Laparoscopic this was statistically significant (p=0.0129) and we also showed that, only 1 patient had Clevien1 and 3 patients had Clevien 2 in Laparoscopic which was statistically significant (p=0.0456). Agcaoglu et al [16] concluded that use of the robot would facilitate minimally invasive resection of large adrenal Tumors in the laparoscopic group. The conversion to open rate was less in the robotic (4%) versus the laparoscopic (11%) group; P=.043. Mishra et al study [17]: Two hundred thirty-eight (82%) LA and 51 (18%) RA cases were identified. The rate of open conversion was 5.9% for RA versus 17.2% for LA (P = .04). Tang et al [20] concluded that no significant differences between Robotic and Laparoscopic group with regard to conversion rates and overall complications. Brunaud et al [12] concluded that Conversion rate, morbidity, and hospital stay were similar in both groups. Thompson et al study [19] concluded that the risk for conversion was associated with Tumor size OR 1.03 (1.00 to 1.06) and with malignancy on histopathology OR 8.33 (2.12 to 32.07). Aksoy et al [11] concluded that there is no difference in perioperative outcome between laparoscopic and robotic group. We examined that, a greater number of [5 (35.7%)] patients had Adenoma in Laparoscopic group and [6 (31.6%)] had myelolipoma in robotic group but this was not statistically significant (p=0.4115). Pahwa et al study [10]: Histopathological evaluation revealed 11 adenomas, eight phaeochromocytomas, 2 adrenocortical carcinomas, and 4 myelolipomas in a study of 25 patients. We observed that, Vas at Pod-1 was more in Laparoscopic [2.7143± 1.8157] compared to Robotic [2.2632± 1.3267] but this was not statistically significant (p=0.4151). Aliyev et al [13] concluded that the pain score on postoperative day 1 was lower in robotic group. Our study showed that, Hospital stay (days) was more in Laparoscopic [2.6429 ± .9288] compared to Robotic [2.0526 ± .2294] and this was statistically significant (p=0.0118). Pineda et al [14] conducted a study in 60 patients. Morbidity and length of hospital stay were similar for both groups. Brunaud et al [12] concluded that hospital stay was similar in both groups. Young et al [15] concluded that the mean hospital stay did not differ significantly between groups (robotic group, 5.86 days (SD 1.16); laparoscopic group, 6.71 days (SD 1.38). In our study, no mortality as well as readmission was reported. Mishra et al study [17]: Two hundred thirty-eight (82%) LA and 51 (18%) RA cases were identified. There were no significant differences in rates of readmission

CONCLUSION

Present study showed that, majority number of patients had Right Laterality in Laparoscopic compared to left laterality in Robotic group but this was statistically significant. We examined that, only 4 patients had Open conversion in Laparoscopic this was statistically significant and we also showed that, only 1 patient had Clevien1 and 3 patients had Clevien2 in Laparoscopic which was statistically significant. We examined that; Operative time (mins) was higher in Laparoscopic compared to Robotic and this was statistically significant.Our study showed that, Hospital stay (days) was more in Laparoscopic compared to Robotic and this was statistically significant. None of the patient had mortality and readmission in our study.

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