Adopting a Robotic Approach to Adrenalectomy: 5 Year Experience at a Single High-Volume Center

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Background

- Use of robotics for adrenalectomy is increasing.
- Hesitation stems from perceived learning curve and increased operative time.
- Our institution established a high-volume center with over 90% robotic cases.

Methods

- Review of all robotic adrenalectomies by a single surgeon from 2019 to 2024.
- 108 adrenalectomies performed, 93 selected for final analysis.
- Operative prep time defined as time from patient entering room to surgery start and operative time were tracked.
- Variables of interest included tumor type, size, patient age, BMI and ASA classification.



	Mean	Median
Operative Length	167.6 min	153 min
Operative Prep Time	54.1 min	50 min
Age	56 years	57 years
BMI	33.8	33.6
Size < 4cm	2.55 cm	2.6 cm
Size 4+ cm	6.25 cm	5 cm

Figure 1: Mean operative length across all 5 years was 167.6 minutes. Mean age of patients undergoing adrenalectomy was 56 years with BMI 33.8. Within tumors <4 cm the mean tumor size was 2.55 whereas the mean tumor size for tumors > 4cm was 6.25 cm.

OR PREP TIME						**OPERATIVE TIME**				
Univariate Analysis										
Variable	**Odds Ratio**	**Lower 95% CI**	**Upper 95% CI**	**p- value**		**Variable**	**Odds Ratio**	**Lower 95% CI**	**Upper 95% CI**	**p- value**
Age	-0.10	-0.41	0.20	0.49		**Age**	-0.79	-1.82	0.25	0.13
Pre Op BMI	-0.06	-0.51	0.4	0.80		**Pre Op BMI**	1.28	-0.29	2.85	0.11
Pheochromocytoma	16.61	5.28	27.94	0.00		**Pheochromocytoma**	45.86	9.01	82.71	0.02
Tumor Diameter >4 cm	-8.3	-16.48	-0.11	0.05		**Tumor Diameter >4 cm**	21	-10.18	52.18	0.18
Year of Operation	-6.56	-9.58	-3.55	0.00		**Year of Operation**	-12.24	-21.6	-2.88	0.01
ASA Class 3	15.71	3.48	27.94	0.01		**ASA Class 3**	-10.31	-52.04	31.42	0.62
ASA Class 4	15.56	-2.62	33.73	0.09		**ASA Class 4**	63.13	2	124.26	0.04
						Partial Adrenalectomy	81.99	17.96	146.02	0.01
						Intra Op Transfusion	135.29	47.25	223.32	0.00
Multivariate Analysis										
Age	0.11	-0.22	0.44	0.5		**Age**	-0.4	-1.67	0.88	0.53
Pre Op BMI	-0.1	-0.63	0.44	0.72		**Pre Op BMI**	0.42	-1.62	2.46	0.68
Pheochromocytoma	18.27	5.52	31.01	0.01		**Pheochromocytoma**	14.44	-27.27	56.16	0.49
Tumor Diameter >4 cm	-8.81	-17.97	0.34	0.06		**Tumor Diameter >4 cm**	9.42	-27.23	46.06	0.61
Year of Operation	-6.63	-10.63	-2.64	0		**Year of Operation**	-15.74	-29.93	-1.56	0.03
ASA Class 3	5.84	-8.62	20.31	0.42		**ASA Class 3**	8.49	-38.39	55.36	0.72
ASA Class 4	12.25	-9.55	34.04	0.26		**ASA Class 4**	100.63	22.06	179.21	0.01
						Partial Adrenalectomy	73.54	5.88	141.19	0.03
						Intra Op Transfusion	125.67	17.5	233.85	0.02

Figure 2: The factor that was associated with decreased OR prep time across both univariate and multivariate regression was year of operation. The same was true for operative time. Pheochromocytoma was associated with increased operative prep time. Variables which were associated with increased operative time were ASA 4, partial adrenalectomy, and intraoperative transfusion.

Results

- Mean operative length was 167 minutes and median length of 153 minutes (Figure 1)
- Operative prep time and operative time decreased by year of operation (Figure 2).
- Pheochromocytoma was associated with longer operative prep time but not operative time (Figure 2).
- BMI, age, and tumor diameter were not associated with increased operative time (Figure 2).

Conclusions

- There is a learning curve associated with adopting robotics but operative time decreases over time.
- Both surgeon and operating room will improve over time.
- Factors traditionally associated with increased operative times for laparoscopy including BMI and large tumor diameter did not significantly affect the robotic approach.