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ORIGINAL ARTICLE

Comparison of the outcomes among patients undergoing emergency open appendectomies by senior and junior surgeons: A cross-sectional study.

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ABSTRACT… Objective: To compare the senior and junior surgeons in terms of the outcome of the open appendectomies. **Study Design:** Comparative Cross Sectional study. **Setting:** Holy Family Hospital, Rawalpindi. **Period:** January 2019 to April 2019. **Material & Methods:** Patients of 16 years and above who underwent emergency open appendectomies for suspected appendicitis were included while elective appendectomies and those done for gynecological indications were excluded from the study. After informed consent, 65 appendectomies were included in the study. SPSS v23.0 was used for data entry and analysis. Frequencies, percentages, means and standard deviations were calculated. Chi-square, t-test and Kruskall-Wallis tests were applied to test the significance of the results. Results were then presented in the form of tables. Outcome variables of the study were duration of the symptoms, Alvorado score, WBCs count, duration of surgery, per-operative findings, post-operative antibiotic, home treatment prescription, post-operative hospital stay and complications. **Results:** Out of total 65 appendectomies, 35 (53.8%) were done by junior surgeons, out of which 16 (45.71%) were males. Out of 30 appendectomies done at the hands of senior surgeons, 16 (53.3%) were done by males. There was no significant difference between the senior and junior surgeons except for Alvorado score (higher mean score for senior surgeons), per-operative findings (more complicated appendicitis in case of senior surgeons) and post-operative hospital stay (prolonged for senior surgeons' appendectomies), p values are <0.000, 0.001, and <0.000, respectively. **Conclusion:** This study concludes that junior surgeons can safely perform open appendectomies with no difference in the incidence of complications as compared to senior surgeons.

Key words: Acute Appendicitis, Emergency or Operation Theater, Senior Resident or Junior Resident.

INTRODUCTION

Acute abdomen is a condition characterized by sudden, severe abdominal pain accompanied by abdominal tenderness and rigidity. It is a surgical emergency.[1] Appendicitis is the most common cause of acute abdomen.[2] Appendectomy is the gold standard treatment for appendicitis.[3] It is the most common surgical procedure performed in the emergency.[4] Thus it is the most commonly available operation for the general surgery residents to perform.[5]

Experience seems to affect the outcome of complex surgeries like thyroidectomy and pancreato-duodenectomy.[6,7] However regarding appendectomy the statistics are rather different. The studies have shown that except lesser time from emergency room to operation theater and shorter length of hospital stay, there is no difference in the risk profile of appendectomies performed by senior surgeons as compared to the residents.[8,9] The level of post-graduate residents does not affect the outcome of the appendectomies.[10]

There is lack of such data in our set up. Therefore the aim of this study is to assess the safety of the appendectomies performed by the junior doctors by comparing their outcomes with those of the appendectomies performed at the hands of

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senior doctors.

MATERIAL & METHODS

This is a comparative cross sectional study carried out at the Holy Family Hospital, Rawalpindi over a period of four months, January 2019 to April 2019 after approval from ethical committee (IRF/010/RMU). The study population was the surgeons performing the appendectomies in the surgical emergency. Patients aged 16 and above who underwent emergency appendectomy for suspected appendicitis were included in the study, while elective appendectomies or appendectomies on gynecologic indications were excluded. Fulfilling this criteria and following an informed consent, a total of 65 appendectomies were included in the study. Thirty appendectomies were performed by senior surgeons and 35 by junior surgeons. A senior surgeon was defined as a post graduate trainee-3 (PGT-3) and above, that is PGT-4, PGT-5, senior resident, assistant professor, associate professor, and professor. While a junior surgeon was defined as a PGT-1 or PGT-2. Outcome variables of the study were duration of the symptoms, Alvorado score, WBCs count, duration of surgery, per-operative findings, post-operative antibiotics, home treatment prescription, post-operative hospital stay and complications.

The duration of the symptoms was recorded from the time they first appeared to the time of surgery. Alvorado score is a criteria used for the diagnosis of appendicitis. It comprises of total of 6 clinical parameters and 2 laboratory measurements. It offers a maximum of 10 score. WBCs count were obtained as a part of full blood count (FBC). The duration of surgery was taken from the point when incision was made to the point when appendix was retrieved. Per-operative findings were based on the findings at the time of laparotomy. Post-operative antibiotics include those given during the hospital stay after appendectomy. Post- operative hospital stay takes into account the number of days spent in the ward after the surgery. Home-prescription includes the antibiotics and pain killers prescribed at the time of leaving the hospital. The complications include any complaints made by the patient while in the ward or those that prompt revisit to the hospital after discharge.

Intravenous injections of metronidazole 400mg and ceftriaxone 1g, single dose of each, were given pre-operatively. They were also given in same doses post-operatively for 5 days. Skin was kept open. Ketorolac 30mg intravenous was used as a pain killer, first dose soon after surgery and then after eight hours and then 72 hours after surgery for pain relief.

Statistical package for social sciences (SPSS) v23.0 was used for analysis. Frequencies, percentages, means and standard deviations were calculated. Chi-square, t-test and Kruskall-Wallis tests were applied to test the significance of the results. Results were then presented in the form of tables.

RESULTS

Total of 65 appendectomies were included in the study. Of which, 35 (54%) were done by junior doctors. Mean age of senior surgeons was 30.2 ± 14.9 years and that of junior surgeons was 21 ± 5.27 years. Of 30 senior surgeons, 16 (53.3%) were males while 14 (46.7%) were females. Among 35 junior surgeons, 16 (45.7%) were males and 19 (54.3%) were females.

Mean Alvorado score for the appendectomies of senior surgeons was 7.8 ± 2.1 while of the junior surgeons it was 5.8 ± 2.0. The difference was statistically significant ($p<0.000$). Table-I.

Variable	Senior Surgeon (n ± S.D)	Junior Surgeon (n ± S.D)	P-Value*
Mean Alvorado score	7.8 ± 2.1	5.8 ± 2.0	<0.000
Mean leukocyte count ($\times 10^9/\mu L$)	18.76 ± 13.1	15.58 ± 12.3	0.495
Mean duration of symptoms (Days)	4.5 ± 4.4	3.14 ± 2.6	0.125

Table-I. Comparison of mean Alvorado score, mean leukocyte count and mean duration of symptoms
***p-value ≤0.05 is considered significant.**

Mean leukocyte count was 18.76 ± 13.1×10^9/μL in case of senior surgeons' appendectomies and it was 15.58 ± 12.3×10^9/μL in case of junior surgeons' operations. The difference was found to be statistically insignificant (p=0.495). Table-I.

For senior surgeons, mean duration of symptoms was 4.5 ± 4.4 days and for junior surgeons it was 5.14 ± 2.6 days. This difference was also statistically insignificant (p=0.125). Table-I.

In terms of per-operative findings, incidence of complicated appendicitis was significantly higher in cases of senior surgeons. Table-II.

Per- Operative Findings (Appendix)	Senior Surgeons (n)	Junior Surgeons (n)	P-Value*
Acute inflammation	4	16	0.001
Suppuration	3	8	
Gangrene	8	7	
Perforation	15	4	

Table-II. Comparison of per-operative findings
***p-value ≤0.05 was considered significant.**

About the duration of surgery, 17 of the senior surgeons had a duration of <1 hour while 13 had >1 hour. While in case of junior surgeons 22 had a duration of <1 hour and 13 had >1 hour. The difference was found statistically insignificant (p=0.612). Table-III.

Duration of Surgery	Senior Surgeon (n)	Junior Surgeon (n)	P-Value*
< 1 hour	17	22	0.612
> 1 hour	13	13	

Table-III. Comparison of duration of surgery
***p-value ≤0.05 is considered significant.**

Regarding post-operative antibiotics, all of the 30 senior surgeons and 35 junior surgeons' appendectomies had antibiotic coverage. All of the 65 cases were supported by additional home treatment prescriptions. Table-IV.

Variable	Senior Surgeons (n)	Junior Surgeons (n)
Post-operative **Antibiotics given**	30	35
Home treatment prescribed	30	35

Table-IV. Comparison of post-operative antibiotics and home treatment prescription

Mean post-operative hospital stay for senior surgeons' appendectomies was 3.1 ± 1.01 days while for junior surgeons it was 2.1 ± 0.98 days. The difference was found statistically significant (p<0.000). Table-V.

Hospital Stay (Days)	Senior Surgeons (n ± S.D)	Junior Surgeons (n ± S.D)	P-Value*
Hospital stay	3.1 ± 1.01	2.1 ± 0.98	<0.000

Table-V. Comparison of post-operative hospital stay
***p-value ≤0.05 was considered significant.**

Post-operative complications were divided into early and late complications. 9 of the senior surgeons' appendectomies and 15 of the junior surgeons' appendectomies produced no complication. 13 of the 30 appendectomies performed by senior surgeons had early complications while 8 had late complications. Similarly for appendectomies at the hands of junior surgeons, 13 had early complications and 7 had late complications. This difference was found statistically insignificant (p=0.552). Table-VI.

Complications	Senior Surgeons (n)	Junior Surgeons (n)	P-Value*
None	9	15	0.552
Early	13	13	
Late	8	7	

Table-VI. Comparison of complications
***p-value ≤0.05 is considered significant**

DISCUSSION

As open appendectomy is the most commonly performed surgery in the emergency with residents also taking part in them[4], it is essential to check for the safety of this procedure to ensure provision of best health care to the patient.

This study conducted in a tertiary care hospital, Rawalpindi, Pakistan compares the senior and junior surgeons in terms of the outcomes of open appendectomies based on a variety of pre- operative, intra-operative and post-operative variables.

In our study, mean Alvorado score for the appendectomies of senior surgeons came out

to be significantly higher than those of junior surgeons (p-value <0.000). This is in contrast to the findings of Siam et al. which show no difference in mean Alvorado score between the two groups.[11] The higher Alvorado score for the senior surgeons' appendectomies is probably because of the fact that higher Alvorado score is associated with increased incidence of post-operative complications[12], therefore those patients whose Alvorado score comes to be higher are operated by senior surgeons to better deal the case and thus to minimize post-operative complications.

The higher WBCs count for senior surgeons' cases was found statistically insignificant as compared to that of junior surgeons'. Similarly, prolonged duration of symptoms in case of senior surgeons' surgeries and the greater incidence of prolonged surgery for junior surgeons also came out to be statistically insignificant. This is in line with the findings of Graat et al[13], while Mizrahi et al and Baha et al found the shorter duration of surgery for the senior surgeons.[11,14]

Regarding per-operative findings, senior surgeons' appendectomies had a significantly higher incidence of complicated appendix. This again indicates that appendicitis suspected to be complicated are dealt with by senior surgeons to better manage such cases. This is against the findings of Siam et al, Mizrahi et al and Singh et al[8,11,14], while Graat et al found normal appendix occurring more frequently in the cases of senior surgeons.[13]

Post-operative antibiotics and home prescription were the part of all of the cases whether of a senior surgeon or a junior surgeon. In the study conducted by Siam et al, home prescription was more often prescribed by senior surgeons as compared to junior surgeons.[11]

Post-operative hospital stay of the patients operated by senior surgeons was significantly higher than those of junior surgeons' patients which is in contrast with the findings of Siam et al.[11] The reason is probably the higher incidence of complicated appendicitis in cases of senior surgeons so they are aptly put under observation for a longer period of time.

There was no difference between the senior and junior surgeons in terms of rate of complications. This is similar to the findings of Siam et al, Graat et al and Mizrahi et al[11,13,14], however Fahrner et al found the higher incidence of 30-day morbidity in cases operated by senior surgeons.[15]

This study has been done with 65 cases, so in order to better validate the safety profile of junior surgeons further studies with a larger cohort can be conducted.

CONCLUSION

The study shows that there is no difference in the outcomes of the appendectomies performed by senior and junior surgeons except for the difference of Alvorado score, per-operative findings and post-operative hospital stay. So as a result we conclude that junior surgeons can safely perform open appendectomies.

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