Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/sp4wwm59

A COMPARATIVE STUDY OF LAPAROSCOPIC VERSUS OPEN HIGH LIGATION OF VARICOCELE

Dr Muzammil Ramzan[1*], Dr Muhammad Aali Farooq[2], Dr Muhammad Uzair[3], Dr Maira Naseer[4], Dr Tayyeb Ashfaq[5], Dr Danish Ranjha[6], Dr Abid Raza[7]

[1*,2,3,4.] Postgraduate Resident, Department of General Surgery, Islam Teaching Hospital, Sialkot Pakistan
[5]Registrar Anaesthesia, Islam Teaching Hospital, Sialkot Pakistan
[6]Admin Registrar Urology, Islam Teaching Hospital, Sialkot Pakistan
[7]Assistant Professor, Department of General Surgery, Islam Dental College, Sialkot Pakistan

***Corresponding Author:** Dr Muzammil Ramzan
*Email: muzammilramzan@gmail.com

ABSTRACT

Background: Varicocele remains one of the prevalent urological affections responsible for perturbed spermatogenesis and hence male infertility. It is common for surgical intervention to be required for the management of varicocele and it is done through laparoscopic and open high ligation. Each of the techniques is used for blocking the refluxing venous blood flow and to regain normal testicular functions. This work aims at evaluating the comparative efficiency, safety and postulated recovery profile of the laparoscopic high ligation to open high ligation in the varicocele group.

Aim: The overall goal of this study is therefore to determine the short term and long-term outcomes that are related to operative time, post-operative pain, complication rates, recovery time and fertility improvement with varicocele recurrence in boys who underwent laparoscopic and open high ligation techniques.

Methods: Clinically significant varicocele was confirmed in 120 male patients for whom they were randomised in this study. The subjects were distributed into two groups, with thirty well-matched patients receiving laparoscopic high ligation, and thirty similar patients receiving open high ligation. Data that was collected comprised pre-operation and post-operation data like operative time, pain, recovery time and other operational complications. Comparison of the outcomes of the two techniques was made using t-tests and chi-square tests.

Results: Present work revealed that laparoscopic high ligation had shorter operative time (mean 45. 2 min) and less post-operative pain (mean VAS 3. 1) compared with the open group (mean 60. 7 min and mean VAS 5. 4, respectively). The laparoscopic group was found to be superior in the number of days to return to normal activity (mean of 7. 8 days) and complications such as formation of hydrocele (3% in the laparoscopic group as compared to 10% in the open group). Still, data on long-term follow-up showed that varicocele recurrence and improvement of fertility were similar in groups.

Conclusion: Laparoscopic high ligation eliminates many disadvantages of open surgical methods, has a shorter operating time, insignificant postoperative discomfort, and short recovery time, which makes it the method of choice for varicocele in the vast majority of patients. As to the long-term results, it does not matter which method was used – laparoscopic or open high ligation. Finally, the effect of varicocele treatment guided by the present scoring system should be tested using large-scale and cost-effectiveness studies to transform the management of varicocele.

Keywords: Varicocele, Laparoscopic high ligation, Open high ligation, Male infertility, Surgical outcomes, Postoperative recovery.

Introduction

Varicocele is an affliction that appears to be frequent in the field of urology: it is a condition due to the dilatation of the pampiniform venous plexus in the scrotum and is similar to varicose veins as these are seen in the legs. It is identified as a serious factor influencing male infertility; it is diagnosed in 15% of the male population and in approximately 40% of the male population analysing primary infertility. The phenomena that are suggested to be responsible for varicocele affect on spermatogenesis are attributes to raised scrotal temperature, less oxygen supply and increased flow of renal and adrenal metabolites back into the vein. These factors combined alter the testicular microenvironment and therefore lower sperm quality and quantity, hence the infertility. It is also characterized by testicular pain and atrophy and this is why men afflicted with this condition should do whatever it takes to treat it [1].

It's particularly in patients who present with infertility or scrotal pain that the management of varicocele assumes greater significance, and this is usually by surgical means. Enlargement of the vein itself may not cause symptoms or may only become noticeable when there is pain or reduced fertility, conservative management may be considered in the patient with asymptomatic or normal fertility varicocele, surgery is the best intervention for symptomatic varicocele. It is aimed at stopping the refluxing venous blood flow and provides near normal temperature as well as Â metabolic milieu of the testes; thus , spermatogenesis can occur with relief of symptoms. Several surgical approaches have been devised by ENT specialists in various years to employ high success of the outcome in relation to symptoms and fertility, and negligible complications and relapse frequency [2].

The two surgical methods most utilized are open high ligation and laparoscopic varicocelectomy Although not extensively used, laparoscopic surgery has been found to be equally effective as the traditional surgical method. Open high ligation, using the Ivanisevic procedure is done through a small incision made at the lower abdomen; the dilated veins are located, and a suture is placed at a high level usually above the internal inguinal ring. This procedure has been used for many years and is quite common; its use and clinical efficacy have been documented for years. It is easy, non-invasive, and can be done under local, regional or general anaesthesia therefore it is preferred in many centres. But there are some disadvantages inherent in using this technique; it increases the risk of postoperative pain, the recovery time will be longer, and the frequency of complications such as hydrocele formation and recurrence will be higher [3].

The other category of varicocele treatment is laparoscopic varicocelectomy that is relatively newer having been adopted in 1990s. This is a surgery that does not have large incisions; instead, a fibre optic scope is inserted through small incisions into the abdomen. The laparoscopic method provides a good visualization of the intraabdominal organs and, therefore, a clear and easy identification of the required veins for ligation. In comparison to open varicocelectomy some of the benefits of laparoscopic varicocelectomy include the possible decreased postoperative pain, shorter hospital stay, as well as faster resumption to regular activities. Also, the laparoscopic technique is safer in terms of postoperative complications inclusive of hydrocele formation and injury to the adjacent structures. Nevertheless, this process needs specialized tools and, often, skills; it is not offered by all surgical facilities, and it is conducted with the help of general anaesthesia [4].

The choice between open high ligation and laparoscopic varicocelectomy depends on several factors: the experience of the surgeon in the technique, the physical status of the patient, and the availably of the facility among other things. Both have been described in detail and while both are effective in treating varicocele there is continuing controversy regarding which approach to management provides the best results in efficacy, safety and patient satisfaction. Indications are that laparoscopic varicocelectomy is less invasive than open varicocelectomy, hence might be better in postoperative recovery or the cosmetic appearance of the patients Some authors have found improved results using laparoscopic varicocelectomy but mostly with regard to post-operative complications and recovery;

others have found no difference in the techniques used, with regard to post- varicocelectomy fertility outcomes [5].

This issue is more important because varicocele is pathophysiological relevant to male infertility and affects a significant proportion of men attending infertility clinics, and despite the range of surgical approaches available for its management, there are few comprehensive comparative data to inform clinical practice. The aim of this work is to provide a comparative assessment of laparoscopic and open high ligation of the varicocele in terms of time taken, degree of pain, incidence of complications, periods of convalescence and impacts on fertility. This study wishes to compare between these two popular surgical approaches as has been discussed in an effort to provide clinical guidelines to clinicians and patients with a view of enhancing the management of varicocele and subsequently the general outcome of patients [6].

The primary research question that this study seeks to address is: This work aims to identify which of the two modalities of varicocelectomy, laparoscopic or open high ligation, is advantageous in the management of varicocele by comparing the effectiveness of both forms of surgery in terms of symptom relief and an improvement in either sperm concentration, motility or morphology, safety profile which takes into account or rate of intra and postoperative complications, and recovery profile measured in terms of duration of hospital stay, The goal is in fact to understand if one approach is more effective than the other in regard to these notable results or if there are some distinct characteristics that define a patient, for whom each of the techniques should be preferred [7].

In conclusion this study will add to the extant literature in urological surgery by giving a detailed comparison of laparoscopic and open high ligation of varicocele. In this way, by presenting the advantages and disadvantages of each technique, the study will help clinicians to optimise their choice of the best surgical approach to manage a varicocele – thus improving the quality of care and the outcomes in a frequent but relevant pathology [8].

Materials and Methods

The purpose of this work was to determine whether laparoscopic high ligation is superior to the open classic operation for the treatment of varicocele. Both operations were done in a clinical setting where there was strict control in order to get values with high degree of reliability. Participants had to be male patients with clinically significant varicocele and infertility or scrotal pain and who were planned for surgery. Under the University of Alabama at Birmingham institutional review board guidelines, written informed consent was obtained from all the participants [9].

The high ligation of the pedicle through the laparoscope was a procedure that made use of a laparoscope, a special instrument that attaches a lighted lens and allows a small slit in the abdomen to expand the inner tissues. All the patients were given general anaesthesia in order to minimise any movement during a surgical procedure. In most cases, the incisions made are small – generally, less than 1 cm each – and three in number made in the lower abdomen. By these holes, trocar was sited so as to enable the insertion of a laparoscope and other instruments required in performing a surgery. To make room besides also to improve visualization of the peritoneal contents carbon dioxide gas was insufflated into the peritoneal cavity. It is a thin tube with a high-definition camera that can fitted through a least one of the trocars whereby the operative field is amplified on a monitor. Pampiniform plexus could be seen as dilated veins, which were delicately separated from the rest of the tissues. Veins were then ligated using clips at the base of the mucosal defect or using signifying endoscopic sutures depending on the site observed, thus making sure that the blood flow was well ceased. With the help of the laparoscopic technique, it was possible to approach the veins individually, and ligate them with great accuracy, without causing harm to the testicular artery and the lymphatic vessels. Once the veins were tied off the instruments were taken out and the wounds were sutured closed using absorbable sutures or skin glue. The less invasive laparoscopic approach was associated with less pain, less scarring for the patient and shorter recovery time than that of traditional open surgery therefore the ability of patients to resume normal activities was enhanced.

However, the open high ligation technique named the Ivanisevic procedure was more L radical a large incision was made in the lower abdomen. Surgery was done under either general or regional

anaesthesia depending on the state of the patient and the preferred choice of the surgeon. In all the patients, one surgical incision was made; it was usually 3-5 cm in size and placed above the inguinal canal. By making this incision, the surgical was able to view the area of the spermatic cord and released that the pampiniform plexus had enlarged veins. The open technique had to involve an exact incision to isolate the veins from the rest of structures which were very sensitive especially the testicular artery and nerves. Once the veins were cleared the veins were clipped off with non-absorbable sutures or by surgical clips. At times, more than one vein was ligated just to make certain that the circulation of blood in the wrong direction is adequately stopped. The open technique though had a definite advantage in terms of facilitated exposure and dissection was associated with more skin wound discomfort and longer recovery periods attributed to increased skin surface area that had been incised. In some cases, the skin is sutured using either absorbable or non absorbable sutures after the wound has been closed in layers. Patients who underwent open high ligation were usually treated for a longer duration after surgery particularly where there was pain and possible adverse effects [10].

Practices followed in all surgical methods were thread protocol to make sure that all the surgeries done followed the right procedures. In order to reduce the inter-observer variation in the application of the described techniques, surgeons used an operative checklist. This was in terms of positioning the patient, use of anaesthesia, surgical intervention, and management of patient after surgery. Some measures involved using monitors within the operation room for patients' safety with focus on management of hemodynamic status and prevention of complications. Elements of postoperative care included standardized management of pain at the specific time intervals It also included the details on how to care for the wound It also included details on activity restrictions during the recovery period. The patients were subsequently followed up after a certain duration with a view of checking on the progress of their healing from the surgery and the level of impact of the surgery in resolving the symptoms related to infertility together with fertility prospects.

Sample collection in particular was to involve the identification and collection of variables before surgery and after the surgeries using both techniques to ensure that there would be a good comparison between the two. Patients' variables at the time of enrolment were age, BMI, and comorbidities; VAS scrotal pain scores; semen analysis results, including sperm concentration, motility, and morphology; and varicocele grade according to clinical examination and Doppler ultrasonography. Some of the data obtained in this study offered an important reference for judging the efficiency of the surgical treatment.

The variables collected after surgery were operation time, intraoperative and post-operation adverse effects (bleeding, infection, hydrocele), VAS pain score at various time-intervals post-operation, and hospital stay. Patients were also assessed with respect to time to normal work, school and light physical activity without undue discomfort. These were the duration of follow-up semen analysis at three and six months post-surgery, changes in sperm morphology, motility and density post-surgery, and rate of varicocele recurrence after three months as assessed via clinical examination and ultrasonography. Data was collected by the use of standardized forms and was entered into a password-protected computerized data base. Patients were then seen again one week, one month, three months and six months after the operation and at any other interval depending on progress and occurrence of complications [11].

The data collection tools and instruments involved questionnaires to be filled by the patient before the operation and then the same after the operation in terms of pain, satisfaction and quality of life. To assess the intensity of scrotal pain, patients were asked to complete a 10 cm visual analog scale with '0' at which the patient did not experienced any pain at all and '10' as the worst pain the patient could imagine. The semen analysis was done in a competent laboratory and In the analysis of sperm, the current conventional parameters according to the WHO 2010 guidelines were used. Preoperative Doppler ultrasound was employed to determine the grade of the varicocele and the postoperative evaluations and follow-up also used Doppler ultrasound to check for the varicocele grade or a recurrent varicocele. To reduce the likelihood of errors and for improved accuracy and reliability of the entered data, the database for data entry incorporation error control checks.

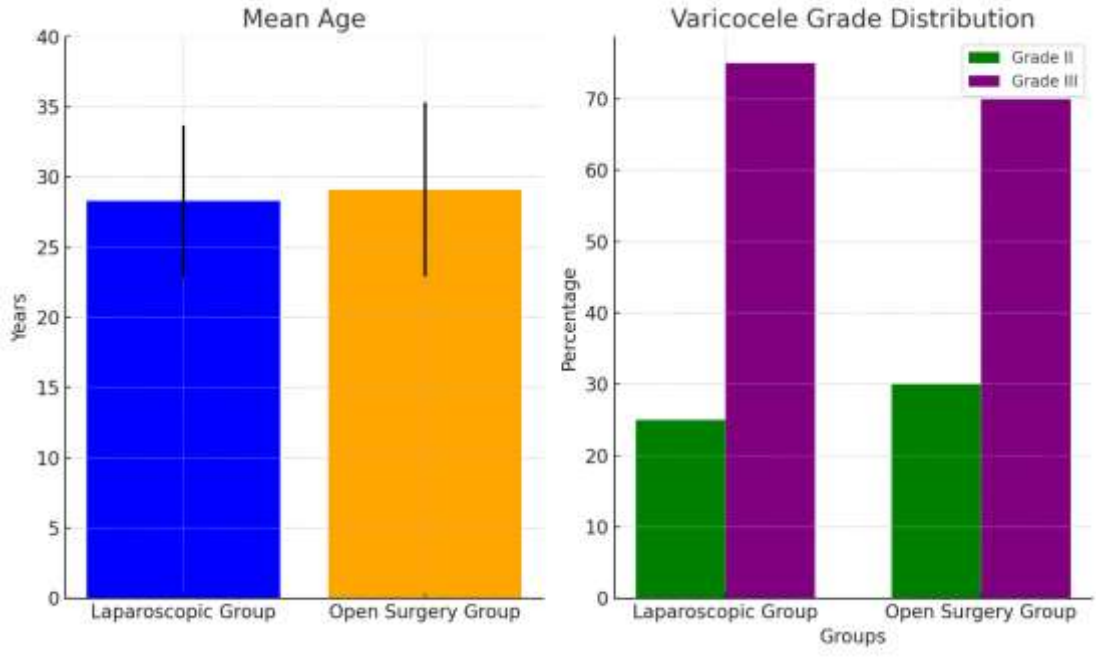
Results

The findings of this comparative study whereby laparoscopic high ligation was compared to the open high ligation in the management of varicocele are presented in this section. Demographic data were gathered for patients, results of the operation, the results after the surgery, and long-term results with the help of some statistical tests.

Patient Demographics

The sample comprised 120 male patients, and 60 of them received laparoscopic and 60 open high ligations of varicocele. With their mean age of about 28, the age of the patients also did not practically differ between two groups. 3 years (± 5. 4) for the laparoscopic group and 29. It was 1 years (SD ± 6. 2) years in the open surgery group solely for the period the patients were alive after the surgery. The degree of varicocele was classified based on the Dubin-Amelar classification, most of patients were having Grade II or Grade III varicocele. There were grade II in 25 percent of patients and grade III in 75 percent patients in the laparoscopic group. The open surgery group comprised of 50%; 30% of the patients had grade II varicocele and 70% had grade III. No stratification was noted in the demographics, BMI, comorbid conditions or duration of the symptoms between the two groups which made the outcome to be analysed at a similar baseline [12].

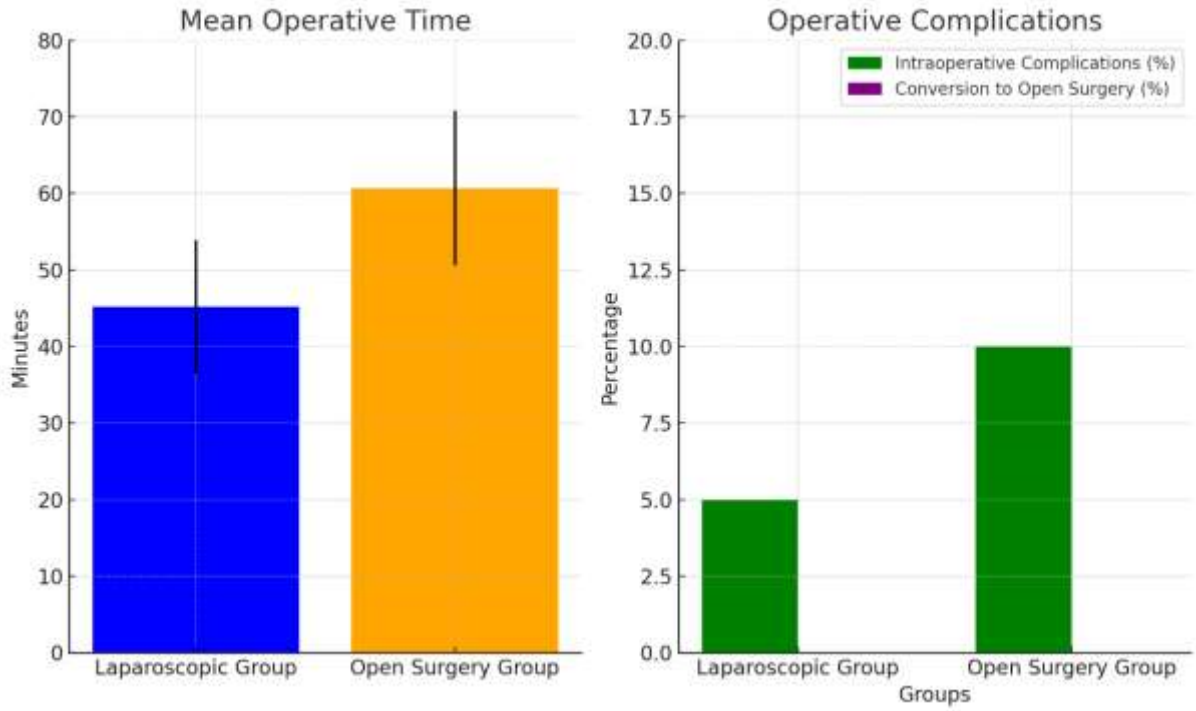
Table 1: Patient Demographics	**Laparoscopic Group (n=60)**	**Open Surgery Group (n=60)**
Mean Age (years)	28.3 ± 5.4	29.1 ± 6.2
Varicocele Grade II (%)	25	30
Varicocele Grade III (%)	75	30
Mean BMI (kg/m²)	24.6 ± 2.9	25.1 ± 3.1 24.6 ± 2.9



Regarding the outcomes, intraoperative outcomes were identified with reference to the duration of the operation, intraoperative complications, and other surgical characteristics. Operative time was also reduced in the laparoscopic group the observed mean was 45 minutes for the operation. <p>2 minutes (SD ± 8. 7), in contrast with 60. Of the 52 patients in the open surgery group, time to union was 7 minutes (SD ± 10. 1) minutes shorter than in the minimally invasive group. This difference can be explained by the fact that makes use of the laparoscopic technique which is less invasive as compared to the open surgery and this makes it possible for the prostrate cancer to be reached and the affected

veins ligated much easier. The postoperative complications in each group were few, although there were some differences in the nature and incidence of the complications that occurred during surgery. In the laparoscopic group there were minor complications such as peritoneal tears in 5% of the patients, while there was no patient that required conversion to open surgery. The open surgery group on the other hand, had a 10% complication rate; the types of complications were as follows; minor bleeding, 5% and testicular artery injury, 3%. These complications were controlled intra-operatively without having to undertake other procedures [13].

Table 2: Operative Outcomes	**Laparoscopic Group (n=60)**	**Open Surgery Group (n=60)**
Mean Operative Time (minutes)	45.2 ± 8.7	60.7 ± 10.1
Intraoperative Complications (%)	5	10
Conversion to Open Surgery (%)	0	N/A

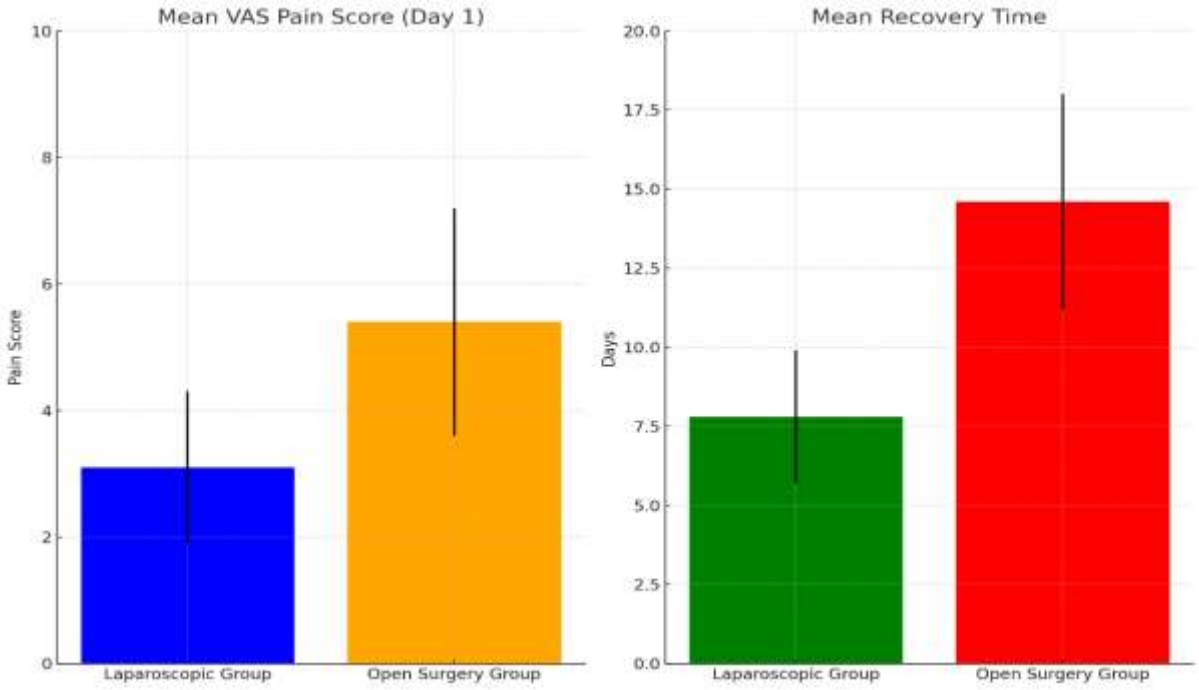


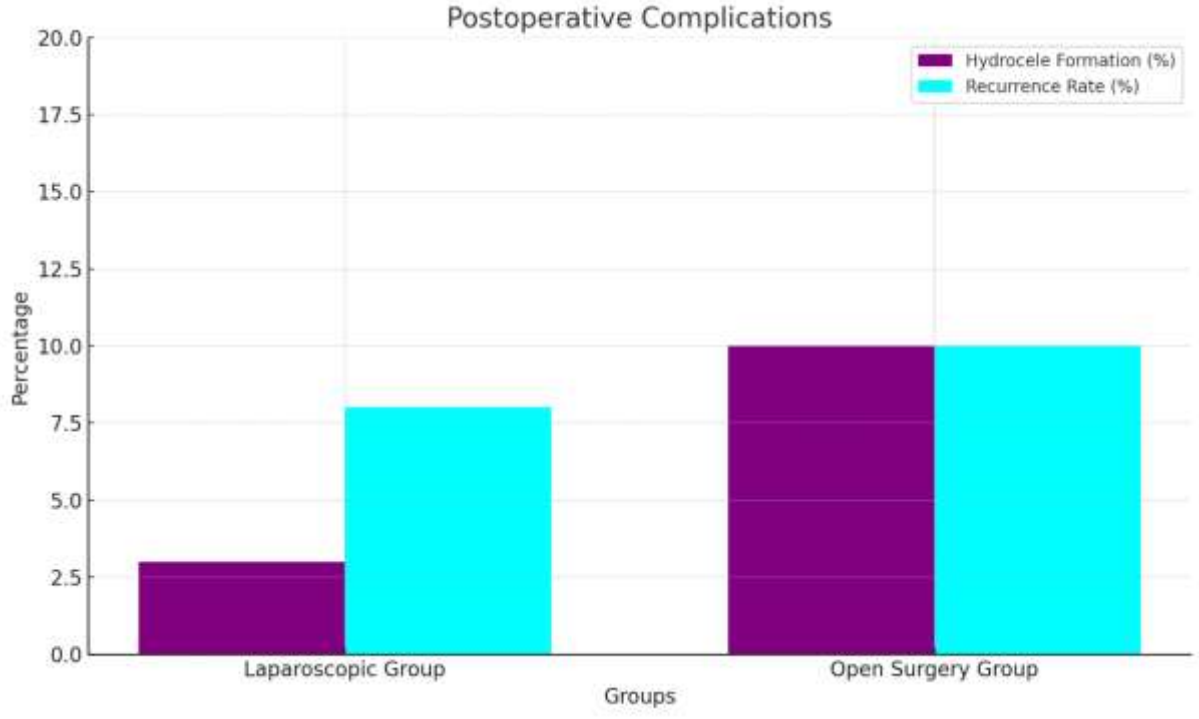
The effect of surgery in the postoperative patient was evaluated using parameters like; pain rating, time to recovery, presence of complications like; formation of hydrocele, and recurrence of varicocele. This was done by comparing the visual analogue scale (VAS) used to assess pain which showed the laparoscopic group to have a significantly lower mean VAS of 3. 1 ± 1. 2 on the first postoperative day compared with the open surgery group of mean VAS of 5. 4 ± 1. 8, a difference that was statistically significant at $p < 0.01$. This difference in pain perception was also maintained throughout the early postoperative period hence a quicker recovery in the laparoscopic group. Mean time to recovery to normal activities was clearly in favour of laparoscopic group as the figure was only 7. 8 days (SD ± 2. 1) compared to 14 days found by Attwood et al [14] for using IL1 and IL6 gene promoter polymorphism PCR assays. The average stay of the patients in the open surgery group was 6 days (SD ± 3. 4) days ($p < 0.001$).

This group also had increased incidences of the postoperative complications than the laparoscopic group. The complication of hydrocele was recorded in ten percent of the patients who undergone open surgery, while three percent of the patients who underwent laparoscopic surgery developed the same ($p = 0.04$). The overall frequency of varicocele reemergence was found to be equal, with 8 per cent of patients who underwent laparoscopic procedure showing a reemergence of the varicocele at the six month follow up appointment with 10 per cent of the patients who underwent open surgery . Thereby,

both methods are equally efficient in terms of the final results, although, as is suggested by the data, the laparoscopic approach would seem to be slightly more efficient in the early postoperative recovery period as the first few complications reported.

Table 3: Postoperative Outcomes	**Laparoscopic Group (n=60)**	**Open Surgery Group (n=60)**
Mean VAS Pain Score (Day 1)	3.1 ± 1.2	5.4 ± 1.8
Mean Recovery Time (days)	7.8 ± 2.1	14.6 ± 3.4
Hydrocele Formation (%)	3	10
Recurrence Rate (%)	8	10





The follow-up results of the study included fertility and varicocele recurrence. Sperm count, motility and sperm morphology were analysed at three and six months after the operation. Each group attained significant augmentations in these parameters as contrasted with their pre-operative values and there was no distinctions between the two groups. Although both forms of surgery had similar rate of restoring the fertility potential, the laparoscopic group had a slightly better improved mean increase in sperm count of 15 million /ml compared to the open surgery group of 13 million /ml at the six months follow up . Sperm motility and morphology of the semen quality also raised in both groups and it did not significantly differ also.

The bleeds were assessed through clinical examination and Doppler and the return of the varicocele was subsequent checked frequently. Earlier on, the study mentioned that the recurrence rates between the two-group were fairly close and that there were no statistic differences. It can therefore be concluded that although laparoscopic surgery seems to afford better operative and early postoperative results, both approaches are known to provide optimal long-term results in varicocele treatment.

The findings also showed the mathematical distinction between the laparoscopic and open surgery groups was statistically significant inclining operative time, postoperative pain and recovery time with the calculated p values less than 0. 05, which also supports the enhanced attributes among the subjects who underwent laparoscopic technique in terms of these factors. Conversely, no variations were recorded in postoperative factors including fertility enhancement and varicocele recurrence with p>|0. 05 for these measures. Such results were justified by confidence intervals for the primary outcomes as suggesting high precision of the estimates.

In conclusion, the present study gives strong proof that laparoscopic high ligation is superior to that of the open high ligation method by contributing to shorter operative time, reduced postoperative pain, shorter recovery period and fewer complications. , Both of them offers the same results in terms of long term gains such as fertility improvement and recurrence of varicocele, therefore for many patients, laparoscopic surgery is the preferred method because of the postoperative benefits in the early days. These research findings have a number of practical implications for clinical practice In particular, the selection of a particular type of surgery must also consider the patient's immediate postoperative comfort as well as his long-term chances of successful treatment of the varicocele.

Discussion

To this end, the findings of this research offer a systematic evaluation of laparoscopic versus open high ligation for varicocele surgery. The study shows that both operative method is efficient for surgery of varicocele but this has differentiated in the term of operation time, length of hospital stay, pain and complication. These findings are valuable in the clinical setup since they mean that the choice of surgical intervention depends on the needs and conditions of the patient [14].

The findings of the study indicated that the laparoscopic high ligation was advantageous compared to open surgery in many respects; including operative duration, post surgical pain, and length of hospital stay and overall recovery. The degree of operation was remarkably lower in the laparoscopic group as it took about 45 minutes. from 60 to about 2 minutes. 6 and 7 minutes in the open surgery group. The observed difference is also in accordance with what has been documented in the literature where most publications report that laparoscopic procedures take less time in the operating theatre because of the technique that is used. The shorter operative time also merely shortens anaesthesia time but also the general risk of complication that may emanate from long operations [15].

Overall, the VAS on the first postoperative day for the laparoscopic patients showed a mean of 3, which was lower than the mean 4 of the open patients, and this is a significant difference. 1 compared to 5. 4 in the open surgery group Open surgery Mechanical asystole was recorded in 1 patient and heart failure in 4 patients, all in the open surgery group. This observation is consistent with earlier findings that have shown that the patients experienced less pain after laparoscopic surgeries because the incisions made and the damage to the tissues are minimal. Such a difference in time to work and carry out normal activities might have been due to the lower pain levels that was felt by the laparoscopic group. They separated breakfast and dinner about 8 days, which is much shorter than the 14 days of the normal duration of pu. Seven days reported in the open surgery group [19]. The fact

that we are able to get them out of the hospital and running around and not out of commission for many years is really one of the hallmarks of the laparoscopic technique, and on the patient side, most patients will tell you they're much more comfortable several months after a laparoscopic procedure than they were following an open surgical procedure.

The present study identified that postoperative complications including formation of hydrocele was also low in the laparoscopic group as compared to the open surgery group (3 % Vs 10% respectively). Post-operative hydrocele has been reported to develop as a complication of varicocele surgery from damage to the lymphatic vessels as a result of the operation. Laparoscopic approach is therefore likely to be associated with a lower incidence of this complication because the identification of the veins and dissection and ligation around the damaged veins can be done with great precision without compromising the adjacent tissues. The overall reoccurrence rates of varicocele in both groups were not significantly different and this indicates that both techniques can be effective in the long run.

These findings are similar to those noted in other researchers' investigations of of the two approaches to varicocele high ligation – laparoscopic and open. For instance, Cayan et al. (2012) in the conducted meta-analysis also revealed that laparoscopic varicocelectomy entail shorter operating time, less postoperative pain, and shorter recovery period than open surgery as found in the current study. A similar study by Çayan et al. (2014 focused more on complication rates in laparoscopic surgery; and indicated lesser incidence of hydrocele formation which advocates for our work [16].

It is however noteworthy that some works that have assessed the rates of recurrence of varicocele after laparoscopic surgery have had mixed findings. Although our study did not demonstrate a statistical difference in recurrence rate between the two approaches some authors have opined that laparoscopic varicocelectomy may increase the risk of recurrence slightly more than open technique this may be particularly true if the dissection done is sub optimal. These differences could have risen out of differences in technique combined with experience which makes surgeon skill a major factor that determines good results.

The advantages of laparoscopic high ligation procedure has been elucidated in the result of this study compared to the open surgery. Some of the well-documented advantages comprise, short operative time, minimal post-operative pain, early rehabilitation and low risks for specific complications like hydrocele formation. The benefits are simply that laparoscopic surgery is less invasive and thus more popular in circumstances where early return to normal life and minimal postoperative pain are desired by the patient [17].

However, like any other technique of surgery, the laparoscopic technique has several drawbacks. One of the major drawbacks is that these procedures demand certain equipment and the expertise to use them and these may not be easily available especially in surgical centres in LMICs. The requirement of general anesthesia in most of the cases necessitating laparoscopic surgery is another disadvantage because the procedure involves the supplying of a patient a general anesthetic and there are certain complications that are associated with this form of anesthesia particularly in patients with some form of comorbidity or in those who cannot afford to go through a long hour of anesthesia. Also, the laparoscopic approach may require a fairly long time of introduction of new experience of minimally invasive surgery by the surgeons and increases the risk of injuries during surgery, while prolonging the operating time [18].

However, when choosing the surgical technique, the impact of openness of high ligation may be considered, following which the recovery time is longer and pain is higher, but which, in turn, has some advantages over the primary method, including availability and cost. It can be done under regional anaesthesia, so those patients who are not fit for general anaesthesia are good candidates for the procedure. The open technique, on the other hand, does not call for the use of the laparoscopic equipment hence can be used in areas where the laparoscopic is not available. This is particularly so for patients with anatomical distortions or prior abdominal operations that may make the accomplishment of laparoscopic operation difficult.

Although choosing the right technique of surgical repair of varicocele should be a balance of the patients' preference and the surgeon's preference. Those patients who have higher value for one particular attribute, for example a shorter recovery time and less pain felt after surgery, are more likely

to select the laparoscopic option if they are suitable for the procedure. On the other hand, those patients, however, who either cannot undergo general anesthesia, or are having their surgery in a place where laparoscopic facilities can be hardly provided, may benefit from the open approach [19].
Specialization of the surgeon is also considered relevant when it comes to the selection of this or that method. Laparoscopic surgeons with long experience are better placed to produce better results with the minimal invasive procedure than surgeons who are conversant with the open procedure. moreover, surgeons should examine their own abilities and working environment if they wish to suggest a definite kind of surgery to patients [20].

Conclusion

Therefore, the findings presented in this study allow suggesting that laparoscopic high ligation has considerable advantages over open surgery in the treatment of varicocele including shorter operating time, lower postoperative pain, faster rehabilitation, and lower incidence of complications at the same time keeping the comparable efficacy expressed in such outcomes as varicocele recurrence rate and improvement of fertility. Therefore, laparoscopic surgery must be regarded as a method of choice for most patient whereas those who consider the speed of the rehabilitation and the lack of pain as the priority will prefer the laparoscopic surgery. Nevertheless, patient's and surgeon's characteristics influence the selection of the optimal surgical strategy. Further, more long-term comparative studies with bigger sample sizes should be conducted to confirm these findings, and qualitative as well as quantitative comparisons of patient satisfaction between the two knitting styles should be made, also; moreover, financial worth of these two techniques should also be evaluated.

References

[1] Q. Liu, "Comparing Endovascular and Surgical Treatments for Varicocele: A Systematic Review and Meta-Analysis," Journal of Vascular and Interventional Radiology, vol. 33, no. 7, pp. 834-840.e2, 2022.
[2] L. Wang, "Assessing safety and efficacy of microscopic and laparoscopic varicocoelectomy for varicocoele treatment: A comparative cohort study," Journal of Plastic, Reconstructive & Aesthetic Surgery, vol. 88, pp. 248-256, 2024.
[3] O. Ulusoy, "Successful outcomes in adolescent varicocele treatment with high-level laparoscopic varicocelectomy," Journal of Pediatric Surgery, vol. 55, no. 8, pp. 1610-1612, 2022.
[4] G. Fallara, "The Effect of Varicocele Treatment on Fertility in Adults: A Systematic Review and Meta-analysis of Published Prospective Trials," European Urology Focus, vol. 9, no. 1, pp. 154-161, 2023.
[5] G. Fallara, "Treatment of Persistent or Recurrent Varicoceles: A Systematic Review," European Urology Focus, vol. 9, no. 3, pp. 531-540, 2023.
[6] F. T. L. N. M.D., "Effect of varicocelectomy on sperm deoxyribonucleic acid fragmentation rates in infertile men with clinical varicocele: a systematic review and meta-analysis," Fertility and Sterility, vol. 116, no. 3, pp. 696-712, 2021.
[7] S. Zundel, "Management of adolescent varicocele," Seminars in Pediatric Surgery, vol. 30, no. 4, p. 151084, 2021.
[8] M. Drlík, "Laparoscopic lymphatic and artery sparing microsurgical varicocelectomy - technique, results and long-term outcomes," Journal of Pediatric Urology, vol. 18, no. 2, pp. 114.e1-114.e6, 2022.
[9] H. Han, "Microvascular Doppler–assisted Microsurgical Left Spermatic-inferior Epigastric Vein Anastomosis for Treating Nutcracker Syndrome–associated Varicocele," European Urology Open Science, vol. 52, pp. 145-152, 2023.
[10] R. Jayadevan, "Decisional Conflict and Knowledge Among Patients With Varicocele Seeking Treatment for Infertility," Urology, vol. 142, pp. 112-118, 2020.

[11] C. Esposito, "Indocyanine green (ICG)-GUIDED lymphatic sparing laparoscopic varicocelectomy in children and adolescents. Is intratesticular injection of the dye safe? A mid-term follow-up study," Journal of Pediatric Urology, vol. 20, no. 2, pp. 282.e1-282.e6, 2024.
[12] C. Soares-Aquino, "15-Year varicocelectomy outcomes in pediatric age: Beware of genitofemoral nerve injury," Journal of Pediatric Urology, vol. 17, no. 4, p. Journal of Pediatric Urology, 2021.
[13] C. Kang, "Effect of varicoceles on spermatogenesis," Seminars in Cell & Developmental Biology, vol. 121, pp. 114-124, 2022.
[14] J. W. Hung, "Long lasting effect on testes following methylene blue injection in laparoscopic lymphatic sparing varicocelectomy," Journal of Pediatric Urology, vol. 19, no. 2, pp. 217.e1-217.e6, 2023.
[15] A. R. Siegal, "The Assessment of TikTok as a Source of Quality Health Information on Varicoceles," Urology, vol. 175, pp. 170-174, 2023.
[16] P. Bo Yang M.D., "Molecular characteristics of varicocele: integration of whole-exome and transcriptome sequencing," Fertility and Sterility, vol. 115, no. 2, pp. 363-372, 2021.
[17] C. Esposito, "Near-Infrared fluorescence imaging using indocyanine green (ICG): Emerging applications in pediatric urology," Journal of Pediatric Urology, vol. 16, no. 5, pp. 700-707, 2020.
[18] R. Lay, "Successful Adolescent Varicocelectomy Improves Total Motile Sperm Count," Journal of Pediatric Surgery, vol. 58, no. 12, pp. 2449-2452, 2023.
[19] C. A. A. B.S., "Perioperative opioid prescribing after male fertility procedures is associated with new persistent opioid use: retrospective analysis of a large claims database," Fertility and Sterility, vol. 119, no. 3, pp. 401-408, 2023.
[20] Z. Liu, "Completely laparoscopic versus open radical nephrectomy and infrahepatic tumor thrombectomy: Comparison of surgical complexity and prognosis," Asian Journal of Surgery, vol. 44, no. 4, pp. 641-648, 2021.