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A CASE SERIES ON THE STUDY OF PRE AND POST OPERATIVE CHANGES IN TESTICULAR SIZE AND VASCULARITY IN INGUINAL HERNIA REPAIR

General Surgery

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ABSTRACT

This study has been carried out during the period of November 2016 to October 2018 at SMIMER, Surat. In this study, a total of 100 patients of symptomatic inguinal hernias who had undergone laparoscopic or open hernioplasty were studied

KEYWORDS

- ***INTRODUCTION***

- Inguinal hernia operations are one of the most common surgical operations are performed by surgeons. Inguinal hernias are five times more common in males. Techniques used in hernia surgery started as simple tissue repairs and today open or laparoscopic tension free mesh repairs are the surgical procedures preferred most commonly.
- Anatomically, there is close relation between the spermatic cord structure and inguinal hernias. Inguinal hernias can carry the risk of ischemia of testis by an intermittent mechanical compression(pressure) on the testicular vessels.
- Presence of hernia may negatively effect sexual activity due to pain and cosmetic concerns.
- Post operative testicular size ,vascularity and function is even more impressing because the operation is performed in inguinal region close to testicular structures and nerves, which are important for testicular vascularity and sexual function. Furthermore, modern, so called tension free techniques, of hernia repair are based on the implantation of mesh to reinforce the inguinal floor.
- Implanted mesh can cause long term tissue induration or even shrink as a part of chronic foreign tissue reaction and affect testicular function and perfusion in this way.
- Testicular volume, morphology and perfusion can be assessed with ultrasound techniques. The vascular resistance or resistive index represent testicular perfusion and can be measured by Color Doppler, power doppler spectral doppler ultra sound. (Using the pulsed wave ultrasound, the peak systolic velocity and the end diastolic velocity can be measured and the RI can be calculated as follows : RI= PSV-EDV/PSV.) Inguinal hernia and inguinal hernia repair may cause mechanical obstruction of blood vessels in spermatic cord and may lead to an increasd RI in Ipsilateral testicle. In patient , with low sperm count, the RI was significantly increased compared with patient with normal sperm count. Hence testicular perfusion is related to testicular function.
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- ***AIMS AND OBJECTIVE*:**

- To investigate the effects of inguinal hernioplasty on testes regarding volume, vascularity and function [5]
- To evaluate the role of mesh fixation in inguinal hernia repair.
- To evaluate various methods of hernia repair.

- ***METHODOLOGY***

INCLUSION CRITERIA

- Patients with bilateral and unilateral inguinal hernia presenting to the department of Surgery SMIMER, Surat.
- Patients aged more than 20 years and less than 50.
- All patients who give consent for the undertaken study.

STUDY TYPE :

- Randomised prospective observational comparative study

EXCLUSION CRITERIA:

- Patients with recurrent inguinal hernia, complicated hernia, and present with varicocoele .
- Patient having obstructive infertility due to vas deferens obstruction.
- Patients with age <20 years and >50.
- Patients with severe medical illness, too old and the patients unfit for surgery.
- Patients receiving corticosteroids, immunosuppressive agents, radiation or chemotherapy are also excluded.

- ***DISCUSSION:***

In our study, we have examined 100 patients. CDUS done preoperatively, early post operative period(7^{th} POD) and late post operative period(at 3 month). In our study there is increase in testicular size in early post operative period. But in late post operative period, there is subside of swelling and testes regain its original size. There is no significant effect on testicular vascularity in preoperative and postoperative period. Increase in testicular size may be due to dissection around cord. Extensive cord dissection cause irritation and cord edema.

In complete hernia there is increase in testicular vascularity postoperatively. In CDUS there is reduction in resistive index. In large gaint hernia there is compression of cord which may hamper testicular vascularity. After surgery there is increase in vascularity. Sometimes complete hernia may require extensive dissection which may cause postoperative testicular swelling which is subside after sometime.

In hernia of long duration, there may be adhesions present between hernial sac and cord structure which may require extensive cord dissection which may cause postoperative testicular swelling. After sometime testicular swelling is reduce. There is no significant changes in vascularity of testis postoperatively.

In congenital hernia , we have only done herniotomy. In young age group we have not used mesh. In herniotomy, postoperatively there is no significant testicular swelling and vascularity is not affected at all.

In recurrent hernia, there is already extensive adhesions present. So reexploration require more dissection and more cord structure affection. So there is more postoperative swelling and there is also testicular atrophy in one patient on recurrent inguinal hernia repair.

In early post operative period, there may be mild rise in testicular volume, but gradually it subside with time.

The aim of all inguinal hernia repair technique is to closethe internal ring with a suture or a biomaterial such as polypropylene mesh. The matter has been raised whether or not the spermatic cord structure are compromised with these techniques. The spermatic cord structures may be exposed to invasive surgical intervention during inguinal hernia reconstruction. Surgical dissection , division, or mechanical trauma to the spermatic artery and vein account for serious trophic changes in the testis. Lee et al. explained that surgical manipulation of the spermatic cord imparts a small, but statistically significant morphological changes in testicular size without a deleterious effect on testicular development, fertility or fecundity.(43).

Factors increasing the risk of ischemic orchitis includes recurrent hernia repairs, large indirect hernias, previous/concomittent scrotal surgery including vasectomies which may disrupt collateral blood supply of the testes and diathermy usage.(73) it typically presents 2-3 days after the surgery and can lead to infarction.(73)

There are many factor lead to decrease and/or interruption of testicular perfusion (Segenreich et al. 1997, Sigman et al. 1997 and Wantz 1986). In some reports, inguinal hernia may impair testicular blood flow, which may attribute to an intermittent mechanical compression effect on the funiculus spermaticus in the inguinal canal.(33, 35 , 66)

Testicular artery and vein injuries, thrombosis of spermatic vein plexus, testicular torsion are the major factors influencing the testicular perfusion. Furthermore, the implantation of a non-absorbable polypropylene mesh during hernia repair causes chronic foreign body reaction involving the surrounding tissue. In case of inguinal hernia repair using different mesh techniques, the spermatic cord structures is potentially affected.by this chronic inflammatory tissue remodeling(pieper et al. 2005). However there are many authors reported that testes has more vessels than expected. Testicular arterial anatomy has been well studied because of its important role in testicular physiology and testicular surgery. Anatomically, the spermatic artery divides into two branches near the testis. Jarow et al. showed that the frequent early branching of internal spermatic artery will prevent inadvertent interruption of testicular arterial blood flow during operations performed upoun the spermatic cord within the inguinal canal(Jarow et al.1992). the testicular artery penetrates the tunica albugenea at the lower pole, proceeding as the capsular artery. Using Color Doppler Ultrasonography,a transmediastinal artery is visible in the upper third of the testes in 50% branches from the capsular artery course through the parenchyma in the testicular septations as afferent arteries and are directed to the gonadal hilum. The testicular veins are not consistently visible using Color Doppler Ultrasonography(oyen 2002).

Many studies suggest an unknown or alternative (collateral) connections between vessels of the cord and other vessels thyat supply blood to testes(35,50)

Zomorrodi and buhluli explained that they isolated and ligated the spermatic cord at the internal ring of inguinal canal for transfixation and placing the allografted kidney in retroperitoneal position with anastomosis of the iliac vessels, and mass ligation of the spermatic cord did not lead to any ischemic problems in follow up period.

Zatura et al. concluded that in the great majority of men the blood supply of testes is ensured by collateral circulation. It is well known that compression, thrombosis, ligating and/or cutting of the spermatic vessels may lead to ischemia, ischemic orchitis and testicular atrophy. Ischemic orchitis typically presents 2-3 days after inguinal hernia surgery and can progress to infarction. This ischemic injury is likely due to thrombosis of venous plexus, rather than iatrogenic areterial injury or inappropriate closure of inguinal canal(33). Venous outflow obstruction secondary to thrombosis of the pampiniform plexus can also cause testicular infarction as a result of overzealous dissection of the cord or excessive use of diathermy; it may also be the result of pressure from a large hematoma in the groin(69)

Testicular torsion is also very important and unpleasant problem, and significantly reduces testicular vascular perfusion. Turner et al. reported that in an experimental study, experimental torsion significantly reduced testicular vascular perfusion. Five minutes after torsion repair, the mean flow value had returned to approximately 70% of the pretortion values. Testicular torsion significantly reduced the venous plasma testosterone concentration at both 7 days and 3 month after torsion repair. They suggest that reperfusion/ oxidative stress may play a role in leydig cell dysfunction, as well as by acting directly in germ cell apoptosis. Testis perfusion can be maintained for a prolonged period in the presence of testicular torsion. Anatomical variability may account for differences in the duration of viability of torsed testis. It is clear that the breakage of testicular perfusion can lead to testicular damage. There are also another reasons such as obstruction of vas deferens, iguinal hematoma, infections and immunological reactions.(35)

Prosthetic mesh implantation is regarded as the standard treatment of inguinal hernias. For about 25 years use of prosthetic mesh in inguinal hernia repair has been routin in general surgery. An estimated 80% of inguinal hernia operations involve placement of prosthetic mesh to form a tension free hernioplasty(33). The prosthetic mesh induces a chronic foreign body reaction creating scar tissue that impart strength to the floor and lead to fewer recurrences. The use of prosthetic materials for inguinal hernia markedly reduces the recurrence rate, post operative hospital stay, pain and discomfort. But , the prosthesis adhere frequently to the cord structure in most cases. The disadvantages are local wound complications, technical difficulties in hernia repair, restriction of mobility by rigid shell, contraction of mesh, and complication related with cord structures such as varicocele, hydrocele ischemic orchitis, testicular atrophy and finally infertility(33)

The influence of the Lichtenstein and shouldice operations on the cord structures in a canine model was investigated and no significant difference with regard to testicular volume and blood flow were found between the operation groups or between the pre and post operative results. Many clinical studies reported that the similar results in which the choice of either Lichtenstein or TEP hernia repair technique did not significantly alter the testicular function. Patient with inguinal hernia have an elevated testicular vascular resistence, which is reversed after repair. The choice of laparoscopic or open herniorrhaphy did not affect reversal of this surrogate of testicular function. Laparoscopic inguinal hernia repair using suture closure of the internal inguinal ring does not impair testicular perfusion. The advantages of the laparoscopic approach also include that its technical ease, it is an out patient procedure, the cod structure remain untouched, the type of hernia is obvious, clear visualization of anatomy(33)

Some clinical and experimental studies also revealed that a dense fibroblastic response encompassing the polypropylene mesh with either trapped or obliterated the testicular vessels and vas deferens.

Peiper et al. reported that the implantation of a nonabsorbable polypropylene mesh in the inguinal region during hernia repair causes chronic foreign body reaction involving the surrounding tissue and the spermatic cord structures in pigs. They observed that venous thrombosis of the spermatic veins occurred in five of 15 cases. The mesh repair may also lead to a decrease of arterial perfusion, testicular temperature, the rate of seminiferous tubules with regular spermatogenesis. Therefore, they recommend strict indication for implantation of a prosthetic mesh during inguinal hernia repair.

On the other hand, prosthetic materials can contract by 20-75% of its original size within one year after implantation in inguinal region. Taylor et al. set out to determine whether this contraction has any effect on testicular or femoral vessel blood flow following open or laparoscopic hernia repair. They found that mesh contraction following inguinal hernioplasty does not adversely affect the testis or femoral vessels and can be used safely for both anterior and preperitoneal approach.

Testicular perfusion following hernioplasty can be easily monitored and evaluated with duplex ultrasonography, the flow in the spermatic artery and testicular artery and its branches is of low resistence, with a relatively broad systolic part and holodiastolic flow. Color Doppler Ultrasonography enables a definitive diagnosis of ischemia and decrease testicular circulation. A pitfall to remember in the diagnosis is that hypervascularity can occur.

Testicular and epididymal swelling along with aslightly decrease echogenicity have been reported to develop in first hour, although in

most cases the hypoechogenicity occur later, so that examining the testis 3 month after the operation seems to be more rational as was performed in our study.

Brisinda et al. also found that there were no statistically significant differences between preoperative and postoperative measurement which included testicular blood flow parameters and testicular volume.

- ***CONCLUSION:***
- There are many application to protect the testicular perfusion and function.
- Trauma to structures of spermatic cord should be minimized and the incidence of testicular atrophy could be reduced by limiting dissection trauma to spermatic cord; never dissecting beyond the pubic tubercle.
- Preserving the cremasteric muscle fibers and reconstructing the fascia can protect the structures of spermatic cord from inflammatory reaction.
- Overzealous dissection of distal hernia sac, dislocation of testis from the scrotum into the wound and concomittent scrotal surgery should be avoided.
- The polypropylene mesh hernioplasty needs to be carefully advised of potential obstruction and compromise to future fertility in men, especially of young reproductive age or with a solitary testicle.
- General opinion is that hernioplasty do not affect the testicular vascularity and its function.
- It is clear that fine surgical dissection and reconstruction, doing respect for anatomy and using proper prosthetic material could be obtain the best results.

RESULT:

RELATIONSHIP OF POST OPERATIVE CHANGES IN TESTICULAR SIZE WITH VARIOUS PARAMETERS ON UNIVARIATE ANALYSIS

Sr. No.	Parameter	"p" value	Result
1.	Complete hernia	P<0.0001	significant
2.	Extensive cord dissection	P=0.023	significant
3.	Congenital herniotomy	P<0.0001	significant
4.	Duration of symptoms	P=0.0003	significant
5.	Recurrent Hernia	P=0.0006	Significant

RELATIONSHIP OF POST OPERATIVE CHANGES IN TESTICULAR VASCULARITY WITH VARIOUS PARAMETERS ON UNIVARIATE ANALYSIS

Sr. No.	Parameter	"p" value	Result
1.	Complete hernia	P=0.525	No significant
2.	Extensive cord dissection	P=0.021	significant
3.	Congenital herniotomy	P<0.920	No significant
4.	Recurrent Hernia	P=0.09	No Significant

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