

# Retzius and Bogros Spaces: A Prospective Laparoscopic Study and Current Perspectives.

Maulana M. Ansari<sup>1</sup>

<sup>1</sup>Ex-Professor of General Surgery, Department of Surgery, J. N. Medical College, A.M.U., Aligarh, UP, India

Received: August 2017

Accepted: August 2017

**Copyright:** © the author(s), publisher. It is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

**Background:** Confusions and misunderstandings abound around Retzius and Bogros spaces. Laparoscopic anatomy of Retzius space(s) was studied during total extraperitoneal preperitoneal (TEPP) hernioplasty. **Methods:** In a prospective study, 60 adult patients with inguinal hernia underwent 68 TEPP hernioplasties (Unilateral 52; Bilateral 8). Standard 3-midline-port technique with direct telescopic dissection was used. Careful observation and instant documentation was done. **Results:** Four well-defined retropubic spaces were observed, namely, (1) true anatomical/prefascial retropubic space, (2) classical/traditional retropubic space (Retzius space), (3) surgical preperitoneal retropubic space, and (4) anatomical preperitoneal retropubic space. Three well-defined subinguinal spaces were recorded, namely, (1) prefascial vascular subinguinal space (Bendavid space), (2) surgical preperitoneal subinguinal space (Bogros space), and (3) anatomical preperitoneal subinguinal space. True anatomical retropubic space (anterior to rectus fascia) communicated directly with prefascial (anterior to transversalis fascia) vascular subinguinal space. Two preperitoneal retropubic spaces had direct communications with two respective preperitoneal spaces of inguinal region. In presence of incomplete posterior rectus sheath, classical retropubic space (Retzius) was found in direct continuity with 'Bendavid space' but not with 'Bogros space'. Transversalis fascia below arcuate line (or both transversalis fascia and complete posterior rectus sheath if present) warranted surgical division to communicate the classical retropubic space with subinguinal surgical preperitoneal space (Bogros). **Conclusion:** Preperitoneal laparoscopy detected four retropubic and three subinguinal spaces hitherto unreported in the literature. Their anatomic dispositions showed huge surgical implications. Classical retropubic space of Retzius did not communicate directly with subinguinal surgical preperitoneal space of Bogros.

**Keywords:** Retzius space, Bogros space, rectus fascia, preperitoneal space, TEPP anatomy.

## INTRODUCTION

'The way to do research is to attack the facts at the point of greatest astonishment'.<sup>[1]</sup> In 1942, Baumann wrote: "One might think that the science of anatomy has completed the detailed description of the human body ... However, some structures are still problems: such as those sometimes found unclear or variable, under individual or extemporaneous conditions, by anatomists armed with a scalpel as their sole means of investigation; also those others described by doctors when they include them in a general practical system or when they draw clinical inferences from them."<sup>[2]</sup> In 1997, Diarra et al stated that "This quotation is still valid at the time of the revolution introduced into morphological exploration by CT scan and MRI examinations, and by the development of

laparoscopic surgery allowing a new approach to the anatomic structures of the abdominal wall".<sup>[3]</sup> This statement is still true even today, and the giants of the field echo serious reservations about the traditional inguino-pelvic anatomy. Poor familiarity with posterior perspective of the complex inguinal anatomy is an important factor for the steep learning curve for the laparoscopic inguinal hernioplasty.<sup>[4-7]</sup> A lot of confusions and misunderstandings abound regarding the retropubic space of Retzius and the subinguinal space of Bogros.<sup>[8-12]</sup> Space of Bogros was first described in 1823 by French anatomist Annet Jean Bogros.<sup>[13]</sup> Retropubic space of Retzius was first described in 1858 by Swedish anatomist Anders Adolf Retzius.<sup>[14]</sup> Live anatomic observations of the retropubic space(s) were made during the total extraperitoneal preperitoneal (TEPP) hernioplasty for the inguinal hernia and are presented herein with new perspectives.

### Name & Address of Corresponding Author

Dr. Maulana Mohammed Ansari  
B-27 Silver Oak Avenue,  
Street No. 4 End  
Dhaurra Mafi,  
Aligarh, Up, India - 202001

## MATERIALS AND METHODS

A doctoral research on the laparoscopic live surgical anatomy was conducted for the award of PhD degree in the Department of Surgery, Jawaharlal Nehru

Medical College and Hospital, Aligarh Muslim University, Aligarh, UP, India from April 2010 to November 2015. The study recruited adult patients with inguinal hernia. Laparoscopic total extraperitoneal preperitoneal (TEPP) hernioplasty was carried out under the Institutional ethical clearance and patient's informed consent. Inclusion criteria were patient  $\geq 18$  years and in ASA grade I – II only (American Society of Anesthesiologists) having fully reducible primary inguinal hernia. Exclusion criteria were patients  $< 18$  years, ASA grade III - V, complicated/ recurrent inguinal hernia, femoral hernia, previous lower abdominal surgery, and lack of written informed consent. TEPP hernioplasty was carried out consistently by the same 3-midline port technique [Figure 1] as reported earlier by the author.<sup>[15-22]</sup> Dissection in the posterior rectus canal was performed unhurriedly with gentle controlled to-and-fro movements of the 0° 10-mm telescopic. Further dissection in the pelvis and inguinal region was carried out by blunt/sharp instrument dissection under low settings of electrocautery.

## RESULTS & DISCUSSION

A total of 66 adult patients (Male 63; Female 3) with uncomplicated primary inguinal hernia consented for the laparoscopic hernia repair. The three female patients were not considered for the TEPP hernioplasty due to one or more pre-operative exclusion criteria and hence excluded from the study. The 63 male patients were taken up for TEPP hernioplasty. Three male patients had forced early conversion because of the instrument injury to the deep inferior epigastric artery just after putting the middle working port (1), excessive CO<sub>2</sub> retention with haemodynamic instability just after start of the procedure (1) and development of frank pneumoperitoneum secondary to early peritoneal injury by the first blunt 11-mm trocar (1), and these patients were excluded from the study. In the remaining 60 patients, a total of 68 TEPP hernioplasties (52 Unilateral and 8 Bilateral) was performed successfully.

During the initial telescopic dissection, the posterior rectus canal was always found bounded anteriorly by the variably condensed and thickened posterior epimysium of the rectus abdominis muscle, i.e., the rectus fascia reported earlier by the author,<sup>[19,20]</sup> and bounded posteriorly either only by the complete posterior rectus sheath (20% reported in 2010 by Mwachaka et al<sup>[21]</sup>; 21% reported in 2017 by Ansari<sup>[22,23]</sup>) or by the incomplete posterior rectus sheath (80% reported in 2010 by Mwachaka et al<sup>[21]</sup>; 79% reported in 2017 by Ansari<sup>[22,23]</sup>) in the upper part above the arcuate line of Douglas and transversalis fascia in the lower part below the arcuate line of Douglas [Figure 2].

Under the direct vision telescopic dissection, the avascular plane between the rectus fascia and the posterior rectus sheath was opened up easily and smoothly, suggesting the separate neurovascular supply of its anterior (rectus fascia) and posterior boundary (posterior rectus sheath) [Figure 2]. The avascular nature of this retrofascial plane confirmed the earlier observations,<sup>[24-26]</sup> and made the posterior rectus approach technically feasible for the TEPP hernioplasty. Continued telescopic dissection in this retrofascial plane within the posterior rectus canal used to lead easily without any difficulty or bleeding into the retropubic space which was found bounded anteriorly by the retropubic fascia,<sup>[19]</sup> the inferior extension of the rectus fascia (pubic bone was never seen bare really in this situation, although the faintly visible sign of lighthouse suggested the presence of the underlying pearly white pubic bone,<sup>[27]</sup> and posteriorly by the transversalis fascia continued into the pelvis. This retropubic space may be termed as 'Classical Retropubic Space' (abbreviated as 'CRS') for further reference and discussion. This retropubic space is in reality in direct communication with the conventional posterior rectus canal, confirming the observations made in 2014 by Wang et al.<sup>[28]</sup> Lateral extension of this space used to lead into the subinguinal vascular space/plane, containing the venous plexus of the Bendavid,<sup>[8,9]</sup> anterior to the transversalis fascia which used to bring down the deep inferior epigastric vessels along with it on to the floor of the operating field. Freeing the deep inferior epigastric vessels from the transversalis fascia used to lead the Sign of Cord, posing severe limitation for the further lateral dissection. Lateral extension of this 'Classical Retropubic Space' into the subinguinal preperitoneal space (Bogros) warranted first deliberate transverse division of the transversalis fascia below the classical arcuate, if one is present, to enter the suprapubic and pelvic preperitoneal space (posterior to the suprapubic and pelvic transversalis fascia) as documented earlier,<sup>[16,22,29]</sup> and only then the lateral extension into the subinguinal preperitoneal space (Bogros) was really possible in an avascular manner. In other words, our observations are in full agreement with that of Kingsnorth et al (2000) and Folscher et al (2000) that 'there is no direct connection between the two spaces',<sup>[11,12]</sup> but in conflict with the opinion of the two giants of the field, Robert Bendavid and Raymond Read who believe in their continuity;<sup>[9,10]</sup> however, further discussion based on more of our observations may elaborate more truth (*vide infra*).

This confusion is the result of the discrepancy in the definition of the Bogros space itself. When we consider the fact that 'true Bogros space' contains, as defined in 1992 by Robert Bendavid,<sup>[9]</sup> the deep inferior epigastric vessels (DIEV) and their branches, then the 'classical retropubic space' does really communicate with the 'true Bogros space'.

When we consider the current popular definition of the Bogros space that it represents the preperitoneal space of the inguinal region as was originally described by Bogros himself, then the ‘classical retropubic space’ is not in direct continuity of the so-called subinguinal preperitoneal space of Bogros. This needs further elucidation (*vide infra*).

In presence of attenuated flimsy transversalis fascia (25% in the present study), the transversalis fascia got torn during the balloon inflation dissection or even under low pressure of the pneumo-insufflation (12 mmHg), creating a false impression of the communication between the classical retropubic space of Retzius and the preperitoneal space of the inguinal region, although they were in reality distinctly separate in their anatomic dispositions. False impression created by the commonly used balloon dissection may be one of the reasons for disparate descriptions reported in the current literature as has been demonstrated well in 2012 by Li and associates.<sup>[30]</sup> In 2000, Folscher and associates emphasized that it was possibly for this reason of dichotomy between disparate observations and erroneous interpretations that “Stoppa himself does not agree that the laparoscopic approach mimics the latter (his GPRVS) [1997]”.<sup>[11]</sup>

The pelvic preperitoneal space deep to the pelvic transversalis may be called as ‘Preperitoneal Retropubic Space I’ or simply ‘Surgical Preperitoneal Retropubic Space’ for further reference and discussion. Through this ‘Surgical Preperitoneal Retropubic Space’ (abbreviated as ‘SP-RS’), the whole pelvis could easily be opened up in an avascular fashion with the transversalis fascia abutting anteriorly with the musculo-osseous pelvic wall and with the preperitoneal fascia (along with peritoneum) enclosing the abdominal viscera.<sup>[18]</sup> Thus the SP-RS really represents the surgical preperitoneal space in the pelvis, and corresponds to the ‘Ventral Space’ of Folscher et al (2000) which was delineated between the umbilico-prevesical fascia UPF (read preperitoneal fascia) and the transversalis fascia.<sup>[11]</sup> Moreover, the SP-RS, i.e., the pelvic preperitoneal space is really the true retropubic space of Retzius if we believe Robert Bendavid,<sup>[9]</sup> the great clinical investigator of our time. He is really credited for popularizing the usefulness of the space of Bogros among the surgical fraternity. According to him, the two spaces of Retzius and Bogros communicate directly to each other, making the feasibility of the preperitoneal mesh repair a reality and supporting the Stoppa repair technically.<sup>[9,10,31,32]</sup>

When the dissection was tried in the true preperitoneal space of the pelvis, the peritoneum was found adherent to the dome of the urinary bladder and hence it was found difficult to dissect in the true preperitoneal/extraperitoneal space (between preperitoneal fascia and peritoneum) of the pelvis. This may really be called the ‘Preperitoneal

Retropubic Space I’ or ‘True Anatomical Preperitoneal Retropubic Space’ (abbreviated as ‘AP-RS’), and it corresponds to the ‘Dorsal Space’ of Folscher et al (2000) which was delineated between the umbilico-prevesical fascia and the peritoneum.<sup>[11]</sup> Even in the paravesical areas, it was found difficult to dissect in the true extraperitoneal space because of the two reasons. Firstly, this space was not avascular due to the shared neurovascular supply of the preperitoneal fascia and the peritoneum, and secondly, the thin peritoneum got torn easily at places, creating potential spaces for herniation of abdominal viscera and sites for prospective development of adhesions between the mesh and the abdominal viscera.

When dissection was done anterior to the rectus fascia (consciously in one case in the very beginning of the study, and inadvertently in two cases later in the study), this prefascial dissection was not found avascular and straightforward because the rectus abdominis muscle and its epimysium (rectus fascia) have a shared neurovascular supply [Figure 3]. Thus the prefascial dissection resulted in minor to moderate ooze with clouding of the operative field, a severe disadvantage during laparoscopic surgery, especially in a closed space. Even a little amount of blood colours the tissues, making the differentiation of the various tissue planes difficult. Blood also absorbs the light, leading to poor endoscopic vision. Four additional phenomena were observed in relation to deliberate or inadvertent pre-fascial dissection. Firstly, the deep inferior epigastric vessels (DIEV) lying within the rectus fascia (above the pubic symphysis in presence of a complete posterior rectus sheath,<sup>[19,20]</sup> or above the arcuate line in presence of an incomplete posterior rectus sheath) was brought down on to the floor of the operative field along with the rectus and transversalis fascia which contain them, and attempt to dissect them in order to keep them on to the roof of the operative field resulted in the free hanging vessels across the operative field, representing the so-called ‘Sign of Cord’. In all three cases, a transcuteaneous polypropylene #1 suture was used to hook the vessels to the anterior abdominal wall. However, in one of these cases, the vessels got sheared by the repeated to-and-fro movements of the slightly roughened instrument underneath them, forcing conversion to the open preperitoneal repair.

Secondly, extensive fibroareolar tissues containing fine nerves and blood vessels were found present between the rectus abdominis muscle and the rectus fascia. The vessels in this region were branches of the inferior epigastric arteries, superficial and deep circumflex arteries supplying both the rectus abdominis muscle and its epimysium/fascia (rectus fascia).<sup>[33]</sup> Hence dissection further down in this retro-muscular but pre-fascial plane was not straightforward, and was found associated with minor to moderate oozing

because of the tearing of these tiny blood vessels, especially the tributaries of the vesico-prostatic venous plexus of the Santorini.<sup>[34,35]</sup> However, the pre-fascial dissection used to lead into a pelvic space bounded anteriorly by the pubic bone which is clearly seen as the sign of lighthouse, and posteriorly by the retropubic fascia, an extension of the rectusial fascia.<sup>[19,20]</sup> This pelvic space may be labelled as the 'Pre-fascial Retropubic Space' or 'True Anatomical Retropubic Space' (abbreviated as 'TA-RS') for future reference and discussion.

Thirdly, extension of the pelvic prefascial plane into the inguinal region was not possible without sharp/blunt division of the rectusial fascia at the lateral border of the rectus abdominis muscle to which it was attached. This manoeuvre of lateral extension used to lead into the subinguinal vascular space filled with branches of inferior epigastric arteries, superficial and deep circumflex arteries, supplying to both the transversus abdominis muscle and its epimysium/fascia called the transversalis fascia,<sup>[33]</sup> resulting in minor to moderate oozing and bloody field. Therefore, it was found technically more useful to make a rent transversely in the rectusial fascia so as to first enter the classical posterior rectus canal and then make lateral extension [Figure 3].

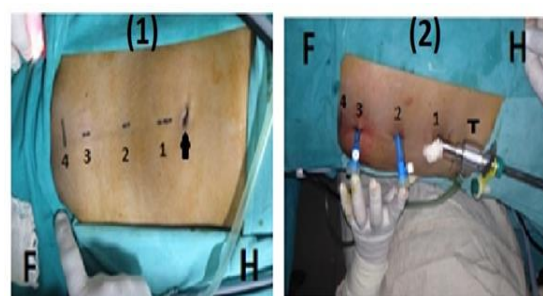
Fourthly, extension of the pelvic prefascial plane into the subinguinal vascular space did not allow easy recognition of the hernial sac because of the presence of rather too much intervening fibrofatty tissues related to the transversalis fascia, making this plane of dissection improper and undesirable.

Presence of multiple retropubic spaces as well as subinguinal spaces possibly led to disparate gross anatomic descriptions by different investigators, creating a lot of confusions and misunderstandings about the true retropubic space of Retzius and the subinguinal space of Bogros. To quote one example, it is really found surprising that the multiple retropubic spaces were observed but overlooked by Arregui who so authoritatively described in 1997 the multiple inguinal spaces in detail by recognition and confirmation of the presence of a definite preperitoneal fascia in addition to the transversalis fascia in the classical first-of-its-kind laparoscopic study of the preperitoneal anatomy from the posterior perspective which has been instrumental for the author to embark on the doctoral research on the laparoscopic preperitoneal anatomy.<sup>[29]</sup> He himself admitted that 'In our own dissections, because of traditional anatomical preconceptions, a clear understanding has been quite tedious to accomplish.' Possibly this was the reason why he himself made disparate statements in the same article that 'This space (posterior rectus space), above the arcuate line is clearly separated from the preperitoneal and peritoneal tissues by the posterior rectus sheath.', and that 'Superficial to this fascia (preperitoneal fascia) is the true preperitoneal plane

of the inguinal area which is in continuity with the space of Retzius of the pelvis.', and that "the preperitoneal space, described by Bendavid as the inguinal space of Bogros containing the epigastric vessels and its branches [Bendavid, 1992], is actually a continuation of the posterior rectus space".<sup>[29]</sup>

Our observations confirmed that the posterior rectus canal directly opens into the classical space of Retzius, both of which are always separated from the requisite surgical preperitoneal space by the fascia transversalis alone below the arcuate line in presence of the incomplete PRS (posterior rectus sheath) or by both the complete PRS (tendinous or attenuated), if present, and the transversalis fascia. This observation of ours is in full agreement with those of Spitz and Arregui who documented in 2001 that the preperitoneal space (required for mesh placement) cannot be entered without breaking the fibres of the complete PRS if present, as was also seen in the present study. Simplifying the multiple retropubic spaces as well as subinguinal spaces into a diagrammatical illustration [Figure 4 and 5] may help us in better understanding of the preperitoneal anatomy of the inguino-pelvic region.<sup>[36]</sup>

The disparate descriptions made by the various clinical investigators and surgeons may be a reflection of the commonly used balloon dissection during the total extraperitoneal preperitoneal (TEPP) hernioplasty, which ruptures the fascial structures haphazardly, creating iatrogenic communications between the adjacent potential spaces, as has been rightly emphasized in 1994 by James Rosser.<sup>[37]</sup> In majority of our TEPP hernioplasties (94%), we used the direct-vision controlled telescopic dissection instead of the blind uncontrolled balloon dissection. The telescopic dissection was found straightforward smooth and quite satisfactory; moreover, it was in full tune with the general principle of every-action-under-direct-vision which is the essential prerequisite of the modern laparoscopic surgery. I have tried my best to simplify the various fascial layers observed in the anterior wall of the pelvis during the total extraperitoneal (TEPP) hernioplasty with a confidence in Hoagland's dictum that 'Simplicity is indeed often the sign of truth and a criterion of beauty'.<sup>[38]</sup>



**Figure 1: Preoperative marking and port placement for laparoscopic total extra-peritoneal preperitoneal**



(TEPP) hernioplasty for right inguinal hernia: F, foot end of patient; H, head end of patient; Arrow, indicates umbilicus of the patient's abdomen; (1): 1, infra-umbilical site for optical port (11-mm); 2 & 3, site for working ports (5-mm); 4, marking for upper border of pubic symphysis; T, optical port with 10-mm telescope in situ; (2): 1, metallic optical port (11-mm); 2, 3, plastic working ports (5-mm); (Adapted with permission from Ansari, MM. Thesis for PhD (Surgery) titled - "A Study of Laparoscopic Surgical Anatomy of Infraumbilical Posterior Rectus Sheath, Fascia Transversalis & Pre-Peritoneal Fat/Fascia during TEPP Mesh Hernioplasty for Inguinal Hernia", Aligarh Muslim University, Aligarh, India, 2016)

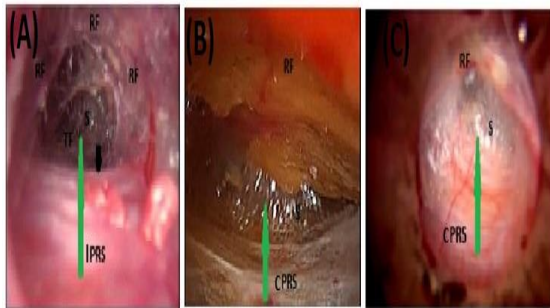


Figure 2: Totally Avascular Telescopic Dissection underneath the rectus fascia (RF): (A) Patient with incomplete posterior rectus sheath; (B-C) Patients with complete posterior rectus sheaths; RF, Rectus fascia covering the undersurface of rectus abdominis muscle (not visible) and extending as the retropubic fascia (RPF) in the pelvis; S, sign of lighthouse faintly visible due to presence of the retropubic fascia (RPF); TF, transversalis fascia; IPRS, incomplete posterior rectus sheath with formation of a primary arcuate line (black arrow); CPRS, complete posterior rectus sheath without formation of a primary arcuate line; Green arrow, indicates the posterior rectus canal between rectus fascia and posterior rectus sheath; (Adapted with permission from Ansari, MM. Thesis for PhD (Surgery) titled - "A Study of Laparoscopic Surgical Anatomy of Infraumbilical Posterior Rectus Sheath, Fascia Transversalis & Pre-Peritoneal Fat/Fascia during TEPP Mesh Hernioplasty for Inguinal Hernia", Aligarh Muslim University, Aligarh, India, 2016).

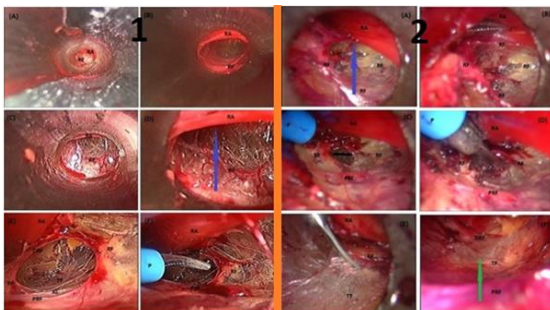


Figure 3: Prefascial Telescopic Dissection anterior to rectus fascia in posterior rectus canal in two patients: (1A-D & 2A-B): Initiation of prefascial telescopic dissection in posterior rectus canal with prefascial plane (blue arrow) getting opened up between rectus abdominis (RA) and rectus fascia (RF); (1E & 2C): Rectus fascia opened up with

transversalis fascia (TF) visible through the rent in rectus fascia, with proximal rectus fascia (PRF) covering the incomplete posterior rectus sheath and its arcuate line (AL), and with distal rectus fascial (DRF) abutting rectus abdominis muscle (RA); (1F & 2D-F): Dissection started underneath rectus fascia; Green arrow, indicates the plane of dissection between rectus fascia (RF) and transversalis fascia (TF) distally; P, plastic working port with Maryland dissector in-situ; V, deep inferior epigastric vessels; (Adapted with permission from Ansari, MM. Thesis for PhD (Surgery) titled - "A Study of Laparoscopic Surgical Anatomy of Infraumbilical Posterior Rectus Sheath, Fascia Transversalis & Pre-Peritoneal Fat/Fascia during TEPP Mesh Hernioplasty for Inguinal Hernia", Aligarh Muslim University, Aligarh, India, 2016)

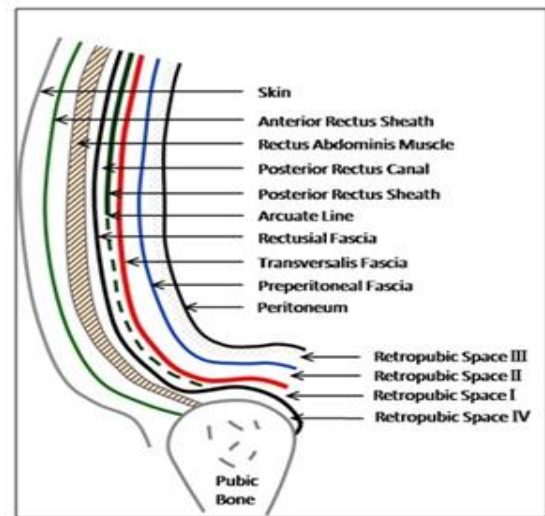


Figure 4: Diagrammatic Illustration of the Four Retropubic Spaces (Sagittal Section of Lower Anterior Abdominal Wall): Retropubic Space I, classical retropubic space; Retropubic Space II, surgical preperitoneal retropubic space; Retropubic Space III, anatomical preperitoneal retropubic space; Retropubic Space IV, true anatomical retropubic space; (Adapted with permission from Ansari, MM. Thesis for PhD (Surgery) titled - "A Study of Laparoscopic Surgical Anatomy of Infraumbilical Posterior Rectus Sheath, Fascia Transversalis & Pre-Peritoneal Fat/Fascia during TEPP Mesh Hernioplasty for Inguinal Hernia", Aligarh Muslim University, Aligarh, India, 2016)

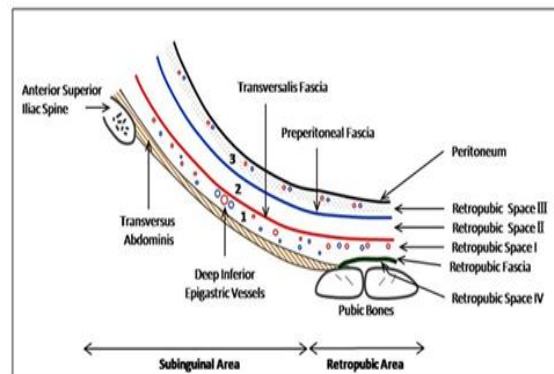


Figure 5: Diagrammatic Illustration of the Four Retropubic Spaces and Three Subinguinal Spaces

**(Transaxial Section of Right Lower Anterior Abdominal Wall at the Level of Pubic Bones): Retropubic Space I, classical retropubic space; Retropubic Space II, surgical preperitoneal retropubic space; Retropubic Space III, anatomical preperitoneal retropubic space; Retropubic Space IV, true anatomical retropubic space; 1, prefascial subinguinal space (Bendavid space); 2, surgical preperitoneal subinguinal space (Bogros space); 3, anatomical preperitoneal subinguinal space; (Adapted with permission from Ansari, MM. Thesis for PhD (Surgery) titled - "A Study of Laparoscopic Surgical Anatomy of Infraumbilical Posterior Rectus Sheath, Fascia Transversalis & Pre-Peritoneal Fat/Fascia during TEPP Mesh Hernioplasty for Inguinal Hernia", Aligarh Muslim University, Aligarh, India, 2016)**

## CONCLUSION

Present study documented four different retropubic spaces (true anatomical, conventional interfascial, surgical preperitoneal and anatomical preperitoneal) and three well-defined subinguinal spaces (prefascial vascular subinguinal space (of Bendavid), surgical preperitoneal subinguinal space (of Bogros) and anatomical preperitoneal subinguinal space) of extreme surgical significance and implications during the total extraperitoneal preperitoneal (TEPP) hernioplasty [Figure 4 and 5], and our observations have added clarity in the sound understanding of the complex inguinal anatomy.<sup>[5,29]</sup> The ever evolving preperitoneal inguinal anatomy as witnessed in the present study was possibly the reason why mentoring had been strongly advocated in 2016 by Sherwinter and associates in addition to the sound laparoscopic skills for the proper familiarization of the laparoscopic preperitoneal anatomy in order to perform a seamless laparoscopic hernioplasty with ease and rapidity.<sup>[7]</sup> The author strongly recommend the observations of Claude Avisse and colleagues that the newer laparoscopic approaches provide new vision of structures known for centuries and the anatomic research is still useful.<sup>[39]</sup>

## REFERENCES

- Green CE (ed.) The Decline and Fall of Science, Publisher: Institute of Psychophysical Research, Oxford, 1972.
- Baumann (1942): cited by Diarra et al (1997)
- Diarra B, Stoppa R, Verhaeghe P, Mertl P. About prolongations of the urogenital fascia into the pelvis: An anatomic study and general remarks on the interparietal-peritoneal fasciae. *Hernia* 1997; 1: 191-196.
- Brick WG, Colborn GL, Gadacz TR, Skandalakis JE. Crucial anatomic lessons for laparoscopic herniorrhaphy. *Am Surg*. 1995 Feb. 61(2):172-7.
- Lange JF, Rooijens PPGM, Koppert S, Kleinrensink GJ. The preperitoneal tissue dilemma in totally extraperitoneal (TEP) laparoscopic hernia repair. *Surg Endosc* 2002; 16(6): 927-930.
- Vidovic D, Kirac I, Glavan E, et al. Laparoscopic totally extraperitoneal hernia repair versus open Lichtenstein hernia repair: results and complications. *J Laparoendosc Adv Surg Tech A*. 2007 Oct. 17(5):585-90.

- Sherwinter DA, Hope WW, Lavotshkin S. Laparoscopic Inguinal Hernia Repair. *Clinical Procedures: Medscape*, August 09, 2016. (<http://emedicine.medscape.com/article/1534321>) (Accessed: August 04, 2017)
- Quinn TH. Anatomy of Groin: A View from Anatomist. In: Robert J. Fitzgibbons Jr, A Gerson Greenburg (eds.) *Nyhus and Condon's Hernia*, 5th Edition, Chapter 6, Philadelphia: Lippincott-Williams-Wilkins, 2002, pp 55-70.
- Bendavid R. The space of Bogros and the deep inguinal venous circulation. *Surg Gynecol Obstet* 1992; 74: 335-358.
- Read RC. Anatomy of abdominal herniation: The parietoperitoneal spaces. In: Nyhus LM, Baker RJ, Fischer JE (eds.) *Mastery of surgery*. 3rd Edition, Vol. II, Little Brown, Boston, 1997, pp 1795-1806.
- Folscher DJ, Leroy J, Jamali FR, Marescaux J. Totally extrafascial endoscopic preperitoneal hernia repair: a merger of anatomy and surgery. The exact description to endoscopically dissect the spermatic fascia. *Hernia* 2000; 4: 223-227.
- Kingsnorth AN, Skandalakis PN, Colborn GL, Weidman TA, Skandalakis LJ, Skandalakis JE Embryology, anatomy and surgical applications of the preperitoneal space. *Surg Clin N Am* 2000; 80: 1-24.
- Bogros AJ. De La Region Iliaque: Et Description D'un Nouveau Procédé: Pour Faire La Ligature Arteres Epigastrique Et Iliaque Externe. PhD Thesis, Faculty of Medicine, Paris, 1823.
- Retzius AA. Some remarks on the proper design of the semilunar lines of Douglas. *Edinburgh Med J* 1858; 3: 865-867.
- Ansari (2013): Ansari MM. Effective Rectus Sheath Canal: Does It Affect TEP Approach for Inguinal Mesh Hernioplasty. *Journal of Experimental and Integrative Medicine* 2013; 3(1): 73-76.
- Ansari (2014): Ansari MM. Complete posterior rectus sheath and total extra-peritoneal hernioplasty. *Saudi Surgical Journal* 2014; 2(4): 80-83.
- Ansari (2015a): Ansari MM. Arcuate Line Variations: Are they important for TEP surgeons? *Kuwait Medical Journal* 2015; 47: 313-316.
- Ansari (2015b): Ansari MM. Fascia Transversalis - A Study of Live Surgical Anatomy during Laparoscopic Total Extra-Peritoneal Hernioplasty. *International Journal of Science and Research (IJSR)* 2015; 4(8): 1788-1796.
- Ansari (2017a): Ansari MM. Rectus Fascia: A New Entity of Laparoscopic Live Surgical Anatomy. *Open Access Journal of Surgery* 2017 April; 3(4): pp 1-5. DOI: 10.19080/OAJS.2017.03.555618.
- Ansari (2017b): Surgical significance of rectus fascia during TEPP hernioplasty. *Int. J Sci Appl Res* 2017 July; 4(7): 13-21.
- Mwachaka PM, Saidi HS, Odula PQ, Awori KO, Kaisha WO. Locating the arcuate line of Douglas: is it of surgical relevance. *Clin Anat* 2010; 23(1): 84-86.
- Ansari (2017c): Ansari MM. Arcuate Line of Douglas: A Prospective Study of Laparoscopic Live Surgical Anatomy during TEPP Hernioplasty. *International Journal of Science and Research* 2017; 6(6): 2348-2363.
- Ansari (2017d): Ansari MM. Posterior Rectus Sheath: A Prospective Study of Laparoscopic Live Surgical Anatomy during TEPP Hernioplasty. *World J Lap Surg* 2017 (In Press).
- Williams PL, Bannister L, Berry M, Collins P, Dyson M, Dusse J, Fergusson M (eds.). *Gray's Anatomy*. 38th Edition, London, Churchill Livingstone, 1998, pp.551-559.
- Sinnatamby C (ed.). *Last's anatomy*, 10th Edition, Edinburg, Churchill-Livingstone, 2000, pp.218-219.
- Flament JB, Avisse C, Delattre JF. Anatomy of the abdominal wall. In: Robert Bendavid, Jack Abrahamson, Maurice E.

- Arregui, Jean Bernard Flament, Edward E. Phillips (eds.) Abdominal Wall Hernias: Principles and Management, Chapter 8, Springer-Verlag, New York, 2001, pp 39-63.
27. Scott-Conner CEH (ed.) Scott-Dawson: Essential Operative Techniques and Anatomy, 4th Edition, Chapter 116, Philadelphia: Lippincott-Williams-Wilkins, 2014, p 630.
  28. Wang WTW, Knight-IV WA, Blomkalns AL. Rectus Sheath Hematoma. Medscape November 2, 2014. <http://reference.medscape.com/article/776871-overview#showall> (Accessed 25.07.2017)
  29. Arregui ME. Surgical anatomy of the pre-peritoneal fasciae and posterior transversalis fasciae in the inguinal region. *Hernia* 1997; 1: 101-110.
  30. Li G, Qian Y, Bai H, et al. Intertransversalis fascia approach in urologic laparoscopic operations. *Arch Surg* 2012; 147(2): 159-167.
  31. Stoppa RE. The giant prosthesis for the reinforcement of the visceral sac in the repair of groin and incisional hernias. In: Nyhus LM, Baker RI, Fischer JE (eds.) *Mastery of Surgery* 3rd Edition, Vol II, Little Brown, Boston, 1997, pp 1859-1869.
  32. Palanivelu C. *Operative Manual of Laparoscopic Hernia Surgery*. 1st Edition, Vol. 1, Ch. 4, Pragati Offset, Tamilnadu (India), 2004, pp. 39-58.
  33. Rosen MJ, Petro CC, Stringer MD. Anterior Abdominal Wall. In: Susan Standring (ed.) *Gray's Anatomy: The Anatomical Basis of Clinical Practice*, 41st Edition, Chapter 61, Elsevier, UK, 2016, pp. 1069-1082.
  34. Santorini GD. *Observationes Anatomicae. Venetiis, apud J. B. Recurti*, 1724.
  35. Power NE, Silberstein JL, Kulkarni GS, Laudone VP. The dorsal venous complex (DVC): dorsal venous or dorsal vasculature complex? Santorini's plexus revisited. *Br J Urol Int* 2011; 108(6): 930-932.
  36. Spitz JD, Arregui ME. Fascial anatomy of the inguinal region. In: Robert Bendavid, Jack Abrahamson, Maurice E. Arregui, Jean B. Flament, Edward H. Phillips (eds.) *Abdominal Wall Hernias: Principles and Management*, 1st Edition (Reprint), Chapter 8, Springer Science-Business Media, New York, 2001, pp. 86-91.
  37. Rosser J. The anatomical basis for laparoscopic hernia repair revisited. *Surg Laparosc Endosc* 1994; 4(1): 36-44.
  38. Hoagland M (ed.) *Toward the Habit of Truth: A Life in Science*, 1st Edition, New York: W.W. Norton, 1990.
  39. Avisse C, Delattre JF, Flament JB. The inguinofemoral area from a laparoscopic standpoint. History, anatomy, and surgical applications. *Surg Clin North Am*. 2000; 80(1): 35-48.

**How to cite this article:** Ansari MM. Retzius and Bogros Spaces: A Prospective Laparoscopic Study and Current Perspectives. *Ann. Int. Med. Den. Res.* 2017; 3(5):SG25-SG31.

**Source of Support:** Nil, **Conflict of Interest:** None declared