



The effect of lower abdominal and pelvic gynecological surgery on the pyramidalis muscle and its function

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Abstract

Objectives: to determine the effect of lower abdominal and pelvic surgery on the Pyramidalis muscle and its function. Also to identify the normality of that muscle in women, its relation to sexuality and the possible need of repair of distorted muscle to restore sexuality. *Design:* Prospective randomized operative and clinical study.

Setting: Department of obstetrics and gynecology, Kasr El Aini, Faculty of Medicine, Cairo University, Egypt and Al-Sabeen hospital, Sana'a University, Yemen. *Patients and methods:* the Pyramidalis muscle was examined for normality in 1000 women having laparotomy for obstetric and gynecological causes. These cases Included 152 cases having previous surgery and the muscle was proved to be significantly deformed and fibrosed in 128 (84.2%) of the cases. Similar number of cases were compared to cases has no such muscle and another has normally intact muscle. The state of sexuality was determined before and after surgery and after the corrective surgery in the cases having deformed and/or fibrosed muscles. The sexuality was determined by Kasr El-Aini Sexual assessment sheet. *Results:* Absence of the Pyramidalis muscle was recorded in 128 cases. The normal Pyramidalis muscle was commonly rhomboid with triangular abdominal and perineal parts. The latter has the same origin and is inserted in the anterior surface of the pubic bones, clitoris and the labia minora. This muscle may be also formed of two flat muscle bundles in 26.2% of cases. The sexuality was found to be involved when the muscle was deformed and/or fibrosed after surgery. Repair of these involved muscles pyramidaloplasty usually results in significant improvement of female sexuality. *Conclusions:* The pyramidalis muscle must be considered a sexual muscle related to the superficial perineal muscles. Accordingly, care must be considered during surgery for preserving this muscle to maintain normal sexuality in these cases.

Key words: Pyramidalis muscle, Sexual, muscles, Superficial perineal muscles, Deep perineal muscles, Female sexuality.

Introduction:

The Pyramidalis muscle is studied by many authors and different descriptions and suggestion were given by many of them 1&2 .But, generally this muscle is considered non-significant lower abdominal muscle. It is a small and triangular muscle, anterior to the rectus abdominis, and contained in the rectus sheath. Inferiorly, it attaches to the pubic symphysis and pubic crest, arising by tendinous fibers from the anterior part of the pubis and the anterior pubic ligament. Superiorly, the fleshy portion of the

muscle passes upward, diminishing in size as it ascends, and ends by a pointed extremity which is inserted into the linea alba, midway between the umbilicus and pubis. The precise function of Pyramidalis muscle is unclear, but together the muscles are thought to tense the linea alba³. It may play certain part in the enforcement of the lower abdominal wall and

may also play certain part in normal sexuality.

The variations recorded for this muscle and for the rectus muscles also were recorded by many authors^{4&5}. It may

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be absent in 20% of normal women. Occasionally it is double on one side, and the muscles of the two sides are sometimes of unequal in size. The muscle is innervated by the ventral portion of Thoracic 12 but twigs from the ilio-inguinal, inferior rectal and other nerves may also participate in innervating this muscle. Generally the Pyramidalis is a small muscle like the superficial and deep perineal muscles and it forms with the latter muscles a complete muscular circle around the external genitalia and lower vagina.

To the best of our knowledge special studies necessary to declare the proper anatomical and functional state of that muscle are much defective. The main factor that may affect the integrity of this muscle and its function is a previous lower abdominal and pelvic surgery.

This study was done to determine the normality of this muscle in women and its relation to female sexuality and to declare the effect of the lower abdominal and pelvic surgery in gynecology and obstetrics on this muscle.

Subjects and Methods

The Pyramidalis muscle was randomly examined in 1000 women having laparotomy in our departments for obstetric and gynecological causes. All cases were between 19 and 29 years old and were married for 9 months to 10 years. These cases included 152 cases having previous surgery for similar causes.

The Pyramidalis muscle is generally examined for their presence, shape, size, origin and insertion and their integrity in cases had previous surgery. The sexuality was assessed in cases proved during surgery to have absent muscles and in similar group of cases having deformed and fibrosed muscles and they were compared to similar number of cases having normal intact muscles. Assessment included preoperative and postoperative sexual assessment using the modified "Kasr El Aini Sexual Questionnaire Sheet" prepared by the authors and validated since year 2003. It scores 100 and it includes data from both the wife and husband. The minimal score for the normal Egyptian women is 85 points.

The effect of the routine surgery on sexuality was determined in the compared three groups. In addition, the sexuality was also evaluated after repair of the fibrosed and/or deformed Pyramidalis muscle (pyramidal-plasty). These cases were managed in the last 5 years, from 2005 to 2010, at Kasr EL Aini School of Medicine, Cairo University, Egypt and Al-Sabeen hospital, Faculty of Medicine, Sana'a University, Yemen.

The Z score was used for evaluation of the percentages and the T-student test for the evaluation of the sex scores.

All parts of the research design including the subjects and methods, in addition to the results were revised and approved by the Institutional Review Board (IRB). A written approval for participation in this study was obtained from each patient after explaining the steps of the research study to them.

Results

The Pyramidalis muscle was found to be absent during surgery in 128 (12.8 %) of the studied women. In addition, 128 out of the 152 cases having previous surgery showed the Pyramidalis muscle to be deformed and fibrosed to different extends. 128 of cases proved to have normally intact Pyramidalis muscles were randomly selected to form the third group for comparison.

The normal Pyramidalis muscle was found to be actually rhomboid in shape and is formed of abdominal and perineal parts in 610 (61%) of cases. The abdominal part was commonly small triangular muscle of nearly equal limbs (Fig.1) and is less commonly attached to the back of the lower part of the anterior rectus sheath in 30.7% of cases. The abdominal part originates from the upper border of the symphysis and the pubic crest of the pubic bones and is inserted in the ilnea alba. The perineal part was of nearly similar shape and similar size in most of the cases. It has the same origin and is inserted in the anterior surface of the pubic bones, the suspensory ligament of the clitoris and the labia minora (Fig.2). Another type was also identified in 262 (26.2%) of cases in which the whole muscle is formed of two flat muscle bundles of different

sizes attached in 82.4% to the back of the anterior rectus sheath and extends behind the back of the pubic bones to reach the same attachment sites in the perineum (Fig. 3). Attachment to the perineal structures was proved anatomically during the dissection and removal of large clitoral cysts in 12 cases. In addition, manual traction and electric stimulation of the muscle during the cauterization of bleeding points near this muscle causes movement of the corresponding structures. The size of the Pyramidalis muscle was found to be small and the abdominal portion was 1/3 or less of the length of the space between the umbilicus and the upper border of the pubis in 66.7%. It was also moderate and the length of the abdominal muscle was 2/3 of the same space in 22.3% of cases and large in 11% of cases.

Sexually, the mean sexual desire and/or act was 12±3 in the cases having intact muscle, 7±2 in cases having absent muscle and 8±3 in cases having deformed and/or fibrosed muscle. Orgasm could be identified by 63 (49.2%) of the 128 cases having intact Pyramidalis. Meanwhile, in the cases having absent muscle orgasm could be identified in 29 (22%) and in the deformed muscle in 47 (36%). Accordingly, it was found to be significantly less identified in these cases (P<0.005). Cases having large muscles was found to identify orgasm in significantly higher percentage than those having moderate and small size muscles. (P<0.005). the mean preoperative sex scores recorded were 74.4±4.6 for those have no muscle and 76.2±3.7 in cases having deformed and/or fibrosed muscles and 89.3±3.4 for those having intact muscles, the later figure was significantly high compared to the former ones (P<0.005). The usual lower abdominal and pelvic surgery insignificantly affects sexuality especially if the Pyramidalis muscle was respected during surgery. The same was also recorded in the cases having no muscle but their original scores were significantly lower than the scores of cases having intact muscles (P<0.05). The relation between sexuality and Pyramidalis muscle was also proved in the cases having deformed and/or fibrosed

muscle due to previous surgery. Repair of the deformed and/or fibrosed muscle (pyramidaio-piasty) was found to be commonly associated with improvement of sexuality. The mean sex scores after this reparative surgery was 85.3±4.7 compared to 76.2±2.2 in the cases having no such repair (P<0.05).

Table(1): The pyramidalis findings in the studied cases.

Finding	Numbers 1000	Percentages (100%)
- Absent	128	12.8%
- Shapes and types of muscles**:		
• Rhomboid muscle with triangular abdominal and perineal parts.	610	61%
• Double bundles extending behind the pubis to be attached to the lower vagina and vulva.	262	26.2%
- Size of the abdominal part:		
• Small size (1/3 the space between the umbilicus and pubis or less) .	582	66.7%
• Moderate size (2/3 of the above space) .	194	22.2%
• Large size (more than of the same space)	96	11%

* The pyramidalis muscle was significantly present in women in 87.2% and is also significantly rhomboid with triangular small abdominal part (P>0.005).

** This muscle is significantly attached to the back of the lower part of the anterior rectus sheath in 216 (82 A%) of cases of the second type compared to 187 (30.7%) of the first type.

Table (2): The sexuality, state of Pyramidalis in cases having intact and absent or marked postoperative deformation of the Pyramidalis muscle.

Group State	Cases having intact muscle (128 cases)	Cases having absent muscle (128 cases)	Cases having deformed & fibrosed muscle (128 cases)
Mean sexual desire and/ or act/month	12+3	7+2	8+3
Number of cases that could identify orgasm.	63(49.2%)	29(22.7%)	47(36.7)
Preoperative mean of the sex scores	89.3+3.4	74.4+4.6	76.2+2.2
Postoperative mean of the sex scores	87.6+2.2	75.6+3.6	85.3+4.7

*Orgasm could be felt in 88 (91.6%) of cases having large pyramidalis muscle, in 207(62.9%) of cases having moderate size muscles and 122 (35.7%) of cases having small size muscle.

Discussion

The Pyramidalis muscle was considered insignificant lower abdominal muscle. No much significant consideration was given by surgeons for this muscle during surgery. So, surgery usually produces destruction and/or mutilation and/or inactivation of this muscle during the lower abdominal and pelvic surgery. It may be also involved in the postoperative fibrosis that may result after the operation⁸. Revising the anatomy and function of this muscle was considered essential to declare the need for avoiding loss or mutilation of that muscle and for preserving it during the lower abdominal and pelvic surgery. Anatomically, this muscle was found to be of two different types. The commonest type was the rhomboid shape muscle with triangular abdominal and perineal parts

recorded in (61%), and not only a triangular abdominal part as known previously⁹ (61%). The perineal extension is usually attached to the pubic bone, the clitoris and the labia minora. This muscle may be also formed of two flat bundles that extend posterior to the pubic bone to the previous perineal insertion in 26.2% of the studied cases. and It may be absent in 12.8% of cases. The perineal extension drew the attention towards the relation of that part of the muscle to the female external genitalia and female sexuality. A similar perineal extension was also noticed and was referred to by other authors¹⁰. The perineal extension of this muscle and its attachment to the clitoris and labia minora, in addition to its small size in 66.7% and its lower abdominal and perineal position anterior to the external genitalia drew the attention to its possible relation to the female sexual state. The Pyramidalis must be the muscle which complete the circle of the small sexual perineal muscles present around the external genitalia and participate in spreading the sense of orgasm to the lower abdomen¹¹. Moreover, the innervation of that muscle by thoracic, abdominal and perineal nerve branches as seen in this study may be an important document that may prove the participation of this muscle in spreading the sexual sensation or orgasm. The variability of shape, size ant its absence in some cases may be related to the variability of factors determining sex in women. The Pyramidalis muscle may simulate the G-spot as factor determining the female sex¹². Cases having the classic large rhomboid muscle were found to have more intense orgasm and can commonly identified orgasm and have more satisfactory sex than the cases having other types and other sizes. Cases having such subjective findings may complain of defects in these findings after lower abdominal or pelvic operations or labial and clitoral operations or female genital mutilation or circumcision. Female genital mutilation may be associated with defective sexuality secondary to excision of parts or whole of the labia minora and clitoris. In addition, the associated involvement of the pyraminalis muscle may be a cause of

such defect. sexually, the mean of the preoperative sex scores recorded in the cases proved to have Pyramidalis muscle were significantly higher than those proved to have no Pyramidalis or to have deformed and/or fibrosed and none functioning muscle ($P<0.005$). The lower abdominal and pelvic surgery was found not to involve the Pyramidalis muscle or to affect sexuality if the latter muscle was manipulated cautiously and preserved after surgery in fair condition. The mean of the postoperative sex scores in those having Pyramidalis showed nonsignificant changes of their scores ($P0.05$). The latter findings drew the attention to the relation between this muscle and sexuality and also towards this muscle and lower abdominal and pelvic surgery. Lower abdominal operations may result in partial or complete destruction of the muscle during the dissection of the anterior rectus sheath and separation of the recti from each other to expose the peritoneum. The muscle may be also included in stitches during approximation of the two recti or closure of the rectus sheath. It may be also involved in suture or ligature and its vascularity or its innervations may be interrupted during surgery¹³. Fibrosis involving the muscle or deforming it may be usual sequelae of postoperative healing. Meanwhile excision of large clitoral cyst and female genital mutilation and circumcision are usually associated with complete excision of the clitoris and may be the labia minora and the Pyramidalis loose its connection to the genitalia and in turn a degree of defective sexual function¹⁴. To the best of our knowledge the effect of surgery on the anatomical and functional state of the Pyramidalis muscle and its function were not much studied and were generally much defective. Moreover, the corresponding results of the labial and clitoral surgery, female genital mutilation and female circumcision and their effect on this muscle were also lacking. So, the present study was considered a unique study dealing 'with the state of the normal anatomy of the Pyramidalis muscle and the effect of lower abdominal and pelvic or genital

surgery on that muscle and on female sexuality. Attempts were made during the lower abdominal and pelvic surgery to restore the normal anatomy and function of the Pyramidalis in the cases having previous surgery. The mean of the sex scores after the corrective surgery (pyramidaloplasty) was 85.3 ± 4.7 and the sexuality markedly improved.

In conclusion, the pyramidalis muscle is considered a significant sexual muscle. All the known operative precautions done to preserve the normal anatomy and function of that muscle must be considered for preservation of female sexuality. In addition, corrective surgery may be tried in a present surgery, in some cases having previous surgery to restore the Pyramidalis muscle and female sexuality.

Legends of Illustrations

-Figure 1: The normal abdominal part of the Pyramidalis muscle.

-Figure 2: The perineal part of the Pyramidalis muscle as seen during dissection of clitoral cyst.

-Figure 3- The abdominal part of the Pyramidalis showing well formed muscular bundle extending to the perineum and forming the perineal part of that muscle.

-Figure 4- The rare double flat bundle-like form of the Pyramidalis muscle.

- Figure 5- Deformation and fibrosis affecting the Pyramidalis and the lower part of rectus muscle in cases having previous laparotomy.



Figure (1): the normal abdominal part of the pyramidalis muscle

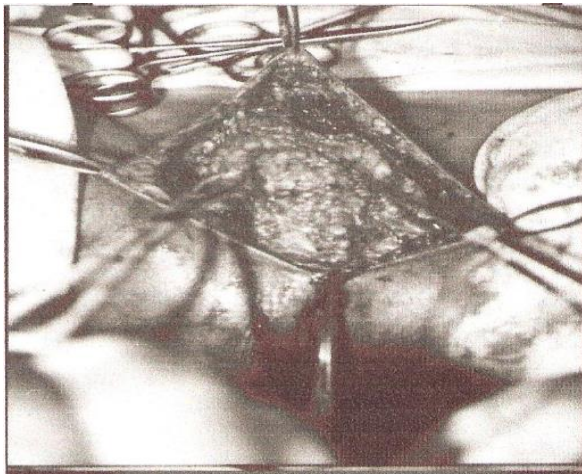


Figure (2): The perineal part of the pyramidalis muscle as seen during dissection of clitoral cyst



Figure (3): the abdominal part of the pyramidalis showing well formed muscular bundle extending to the perineum to form the perineal part of that muscle

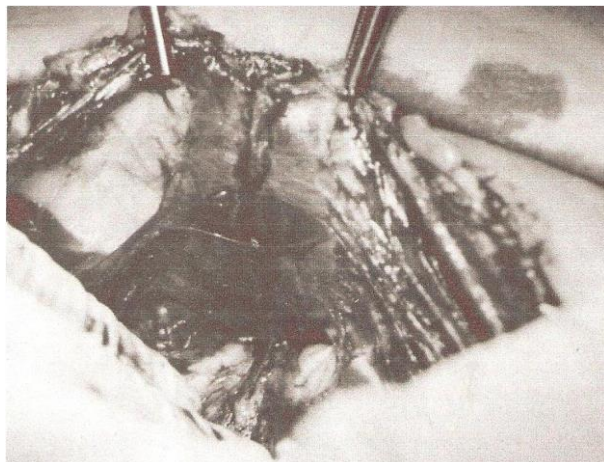


Figure (4): The rare double flat bundle-like muscle of the pyramidalis muscle



Figure (5): deformation and fibrosis affecting the pyramidalis and the lower part of rectus muscle in cases having previous laparotomy

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