

REVIEW PAPERS

POSTERIOR COMPONENT SEPARATION – FIRST REPORT FROM POLAND ON NEW SURGICAL TECHNIQUE USED IN MAJOR ABDOMINAL HERNIA TREATMENT

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The problem of the large incisional hernias management which are simply called the abdominal ones (or ventral hernias) remains a big challenge for a surgeon. It is linked with the broad spectrum of problems related to the preparation of the patient, the selection of the appropriate surgical technique of the anatomical loss supply, proper selection of the biomaterial use and last but not least with a difficult post-operative care, often requiring a cooperation with the anesthetist and sometimes also the need for a respiratory function support (1). But still the problem of surgical hernia treatment is underestimated, mainly due to the lack of awareness of the scientific and technological progress among surgeons which has been made in the field in the beginning of the twenty-first century (2). This unfortunately results in the underestimation of abdominal hernias management by the society. Broad range of different factors need to be considered before the choice of the proper treatment of the individual patient when a surgeon plans to repair significant abdominal wall defects resulting from abnormal wound healing after previous surgical interventions (3).

Abdominal hernias management understood simply as stitching the edges of the fascia should already remain a historical view and such a mistaken belief may only indicate

ignorance of scientific achievements in this field (4). Universality of disease, socio-economic effects of disability and, in the case of treatment – extensive list of possible severe complications, the occurrence of which can be minimized mainly by the appropriate training of surgeons, are among factors indicating the importance of the abdominal hernias management (5, 6, 7). Recent advances in the therapeutic options are being analyzed during every meeting of surgeons interested in the development of this field of medicine – whether in the context of Polish Hernia Club (Polski Klub Przepuklinowy) or Polish Surgery Association, Hernial Section (Sekcja Przepuklin TCHP) – in order to improve the treatment outcomes. Proper understanding the cytology, histology, biomechanics and genetics of wound healing inevitably leads to the belief that the treatment of abdominal hernias need to be based on the use of synthetic materials, as it is in the case in the treatment of groin hernias (8, 9). A specific medical center tradition of the treatment of hernias with the same method for the past several decades, lack of experience in the use of synthetic materials and the belief that just physical approximation of tissues during repair would be sufficient, even at the cost of enormous tissue tensions which could be destructive, can no longer be an excuse for modern operating methods negligence.

Reported complications associated with the implants use are relatively rare and do not affect the overall positive assessment of their application (10). Available literature published over the past twenty years is abundant in the evidence confirming this view (11, 12). Ignoring the rules of a proper, up-to-date recommendations of how to proceed, must inevitably lead to the treatment failures. It is after such failures transferred to the other hospitals when the responsibility is assigned to the other clinical center which have more experience in this field, despite the fact that each subsequent surgical reconstruction is subject to greater risk of failure (13). Therefore it seems that carrying out the most appropriate surgery during the first intervention would be the most appropriate approach. International forums for the exchange of experiences allow a comparison and implementation of most recent approaches which then can be successfully applied in Poland with a proper support and which can contribute to the improvement of the treatment success rate.

One of such new approaches, a *posterior component separation* (PCS), was presented for the first time during the big conference held in Milan in 2015 which was the first global hernia surgery convention by Michael Rosen, a surgeon from the United States (14). There is no clear linguistic equivalent of the name of this procedure in Polish which would present in a concise manner the mechanism of the method, however this surgical technique involves a separation of the myofascial compartments via posterior access. The etymology of the name was created as an alternative to the *anterior component separation* (ACS), which is a modification of the Ramirez technique, well known and successfully applied also in Poland (15). The proposed innovative PCS technique



Fig. 1. Large postoperative hernia

is a procedure which can be a viable alternative to the other methods enabling the elongation of the abdominal walls around the abdominal wall defect, especially in cases of the large midline hernias.

The aim of this paper was to present PCS technique and to analyze preliminary results of this technique use in four cases. According to our knowledge this is the first Polish report on the use PCS technique.

SURGICAL PROCEDURE

Patients were prepared for a surgery on a routine basis. Cephalosporin first generation in three doses was used as antibiotic prevention. The operative field was prepared in a standard way (bathing, shaving, disinfection, drape sheets) (fig. 1).

A perfect knowledge of the anatomy of the abdominal muscle wall is necessary to understand the principles of PCS technique. Medial incision was performed most often within the previous scar removing it as well as the skin excess. Dissected hernia bag was then opened, the contents drained, and then the excess of the bag removed. The next step in the procedure is to open a space between the posterior surface of the rectus muscle and the posterior lamina of rectus sheath (*retromuscular space*), sliding down the peritoneum and the posterior lamina of abdominal rectus muscles sheath, as in the case of the standard operation with mesh placement using *sublay* method. This way we reach arcuate line passing under the rectus muscles; the line is a lateral connection between anterior and posterior lamina of the rectus sheath. Approximately 5 mm medially from this line the longitudinal incision of the posterior lamina is done (fig. 2). This way we create a relatively broad access along the arcuate line, getting into the space between the internal oblique and transverse abdominal muscles.

The next step in the procedure is to open the space between the peritoneum and transverse abdominal muscle (*preperitoneal space*). To perform this we cut off the medial transverse abdominal muscle attachment to the rectus sheath during its entire length using the electrocautery trailers (fig. 3 and 4) As a result, transverse fascia and peritoneum are exposed. Muscle fibers are lateralized. To spare

- 1 – rectus abdominis muscle
- 2 – arcuate line
- 3 – internal oblique muscle
- 4 – peritoneum
- 5 – posterior lamina of the rectus sheath
- 6 – transverse abdominal muscle

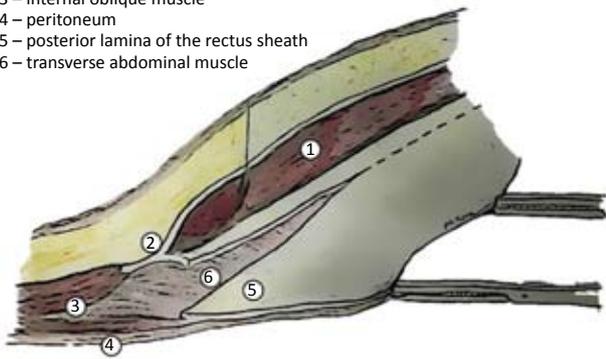


Fig. 2. Posterior lamina of the rectus sheath dissection at a distance of 0.5 cm medially to the arcuate line

visible blood vessels and intercostal and lumbar nerves located perpendicularly to the arcuate line on the posteriori surface of internal oblique abdominal muscle, we create a wide space between them until the anterior axillary line area. These nerves and blood have an important role in maintaining the function of the abdominal rectus after the surgery. If necessary, the space upward from the costal arch up to the myopectineal orifice downwardly and laterally until the iliopsoas muscle should be left. Take special care of the integrity of the peritoneum at this point, because it will act as a barrier between the mesh laid and the peritoneal cavity, so any defects in this layer must be carefully sewn. The same steps can be performed on the other side.

This way as the final result we gain of at least 4-5 cm on each side (fig. 5) which normally would make it possible to close the peritoneum and posterior lamina of rectus sheath without difficulty. An essential element of the success of the operation is obviously the big mesh positioning in the peritoneum and fixing the seams with stitches and/or adhesive (fig. 6). Over the mesh stitch fascia should be sewn (anterior lamina of rectus muscles), preferably with short-stitches technique (suture monofilament having a thickness of up to “0”, with the extended durability, with 5-7 mm distance between incisions covering 5-7 mm of the fascia edges; this way the suture – wound length ratio would be at least 4 to 1). This is easier because the oblique muscles separation form the transverse one extends also the upper myofascial lobe. If the closure tension remains high, which can be recognized by an increase in breathing pressure by 5 mm Hg, single octal

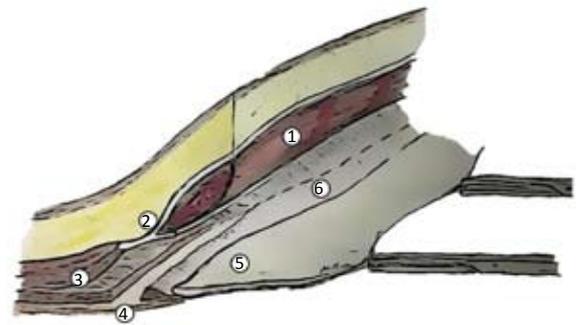


Fig. 3. Abdominal transverse muscle dissection at a distance of 1 cm laterally to the attachment to the rectus sheath

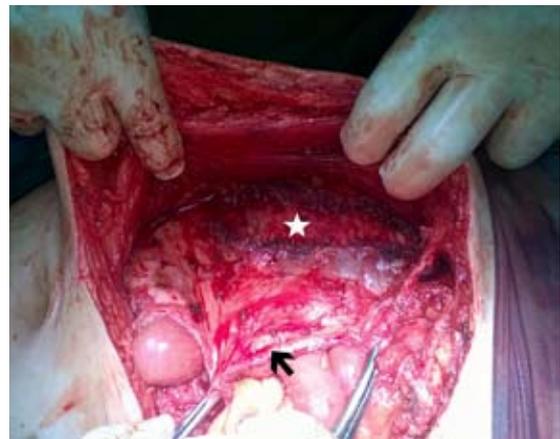


Fig. 4. Transverse abdominal muscle incision along its attachment (asterisk marks an open preperitoneal space; arrow indicates the edge of the peritoneum)

sutures can be applied as suggested by the technique Author. The whole procedure ends by closing the subcutaneous tissue and performing skin plastics. If the drainage would be required, it is suggested to place the drain of the fascia within the subcutaneous tissue in a closed suction system for one day.

DISCUSSION

According to the guidelines of the European Society of Hernia (European Hernia Society), the best method of preventing the occurrence of postoperative hernias are among others: 1) use of continuous suture; 2) avoiding the use of rapidly absorbable fascial suture; 3) the use of monofilament suture; 4) single layer of the anterior suture within the abdominal wall, 5) the ratio of the stitch length / length of the filament 4: 1. Despite following those guide-



Fig. 5. Gained 4-5 cm wide space (both sides marked with asterisks, the arrow indicates the stitched peritoneum)



Fig. 6. 20x30 cm polypropylene mesh in the suprapéritoneal space

lines incisional hernias occurrence is approximately 2-19% in patients after the abdominal surgery.

Closing the abdominal wall with fascia sewn and mesh implementation has been recommended as the optimal management of incisional hernias minimizing the risk of recurrence, which in the absence of the mesh can reach 33%. Multitude of techniques of the abdominal hernia management in the literature of the field – such as tension-free treatment using hernia mesh in a traditional way (*onlay*, *inlay*, *sublay*, *open IPOM* techniques), as well as laparoscopic techniques, raise a reflection that the current methods are still imperfect and that the optimal and clear procedure for this pathology is still looked for.

Meta-analyses showed a significantly higher efficiency of *sublay* vs *onlay* method (16). In PCS technique, criteria mentioned above are applied which enables the technique to be effective.

ACS technique, introduced by Ramirez and then popularized by other authors, was recognized as an effective method of dealing with postoperative hernias.

Based on these experiences and their own experiences Pauli et al. 2015 presented the results of applying the PCS technique showing high efficiency of operations in the 11-month follow-up period (17). Analyzed 29 cases shown only one hernia recurrence. It is worth mentioning that all presented cases were operated using ACS technique previously.

Based on our own modest experience (currently 5 patients operated using PCS technique, including one patient with one-side surgery only, all cases in the age of 41-65, three males, two females, 3 months follow-up period) we can conclude that with the right patient

selection the procedure is relatively simple with almost no bleeding. An important advantage of this technique is operating within the anatomical areas with a small tissue traction which means easy separation within low blood supply areas. It should be noted, however, that an important and indisputable condition for the success of this procedure is a very good knowledge of the anatomy of the anterior abdominal wall. Elongation the abdominal walls during the procedure makes it almost tension-free enables to avoid or at least to minimize suturing the fascia with unnecessary tension creation, which is recognized as one of the main causes of treatment failure and recurrent hernias. The procedure has also lower than traditional hernia management influence on intra-abdominal pressure after surgery, and thus it minimizes the risk of respiratory complications and the occurrence of the abdominal compartment syndrome. Hernia belt application is recommended when the patient is still on the operational table before his post-operative awakening. In most cases, we recommend possible quick patient extubation. However, in the case of giant hernias when we can anticipate respiratory complications, patient stay with the external respiratory support is recommended for a long time, up to several days after surgery. This would reduce the risk of respiratory complications and the occurrence of the abdominal compartment syndrome. Post-operational follow up allows us to conclude that despite the extent of the procedure post-operational pain is small and manageable.

We did not observe any intra – nor postoperative complications. Time of the patients re-

turn to normal physical activity did not differ vs the standard *sublay* technique. We do not observed the abdominal wall relaxation at the muscle attachment cut-off area. A reliable assessment of the long-term results of the technique is currently not possible due to too short follow-up period and a small number of cases. However, the technique assumptions, the use of the potential anatomical access ways, the simplicity and reproducibility suggest that long-term results are at least comparable to those of the ACS technique (18). The advantage of PCS vs ACS is mainly due to the lack of extensive surgical interference within the subcutaneous tissue to create access to the medial attachment of the external oblique muscle, which was associated in some cases with dramatic ischemic complications after vascular injury (19). PCS method is devoid of these drawbacks, since ac-

cess to the muscle attachment which is cut during the procedure is directly via the space in which a synthetic mesh is placed.

In summary, *posterior component separation* (PCS) technique is in our opinion effective, safe, less extensive and less traumatic than the *anterior component separation* (ACS) and should be considered for large midline hernias. Each surgeon dealing with extensive abdominal hernias should be able to perform it correctly. Due to the advantages of PCS technique it seems worthy to be widely used. What is also important in the reality of health care system in Poland this is a low-cost procedure as it requires only a standard large hernial mesh. We strongly believe that the technique presentation and its practical aspects will help you implement it in your own surgical practice.

REFERENCES

1. Blatnik JA, Krpata DM, Pesa NL et al.: Predicting severe postoperative respiratory complications following abdominal wall reconstruction. *Plast Reconstr Surg* 2012 Oct; 130(4): 836-41.
2. Silecchia G, Campanile FC, Sanchez L et al.: Laparoscopic ventral/incisional hernia repair: updated guidelines from the EAES and EHS endorsed Consensus Development Conference. *Surg Endosc* 2015 Sep; 29(9): 2463-84.
3. Ma Q, Xue FS, Li RP: Analysis of risk factors, morbidity, and cost associated with respiratory complications following abdominal wall reconstruction. *Plast Reconstr Surg* 2015 Feb; 135(2): 459e-60e.
4. Romańczuk M, Mitura K, Wróblewski T: Porównanie metod i wyników chirurgicznego leczenia pooperacyjnych przepuklin brzusznych. *Wideochirurgia i inne techniki małoinwazyjne* 2006; 1(3): 95-100.
5. DiCocco JM, Magnotti LJ, Emmett KP et al.: Long-term follow-up of abdominal wall reconstruction after planned ventral hernia: a 15-year experience. *J Am Coll Surg* 2010; 210: 686-98.
6. Dan H, Shell IV, de la Torre J et al.: Open repair of ventral incisional hernias. *Surg Clin N Am* 2008; 88: 61-83.
7. Muysoms FE, Antoniou SA, Bury K et al.: European Hernia Society. European Hernia Society guidelines on the closure of abdominal wall incisions. *Hernia* 2015 Feb; 19(1): 1-24.
8. Pielaciński K, Szczepanik AB, Wróblewski T: Effect of mesh type, surgeon and selected patients' characteristics on the treatment of inguinal hernia with the Lichtenstein technique. Randomized trial. *Videosurgery Miniinv* 2013; 8 (2): 99-106
9. Mitura K, Romańczuk M: Redundant modifications of Lichtenstein technique in hernia repair – a descriptive study of practising surgeons in Poland. *Videosurgery and other miniinvasive techniques* 2009; 4(1): 1-5.
10. Ratajczak A, Kościński T, Banasiewicz T et al.: Migration of biomaterials used in gastroenterological surgery. *Pol Przegl Chir* 2013 Jul; 85(7): 377-80.
11. Pawlak M, Bury K, Śmietański M: The management of abdominal wall hernias – in search of consensus. *Videosurgery Miniinv* 2015; 10 (1): 49-56.
12. Israelsson LA, Jonsson T: Incisional hernia after midline laparotomy: a prospective study. *Eur J Surg* 1996; 162: 125-29.
13. den Hartog D, Dur AH, Tuinebreijer WE et al.: Open surgical procedures for incisional hernias. *Cochrane Database Syst Rev* 2008; (3): CD006438.
14. Pauli EM, Rosen MJ: Open ventral hernia repair with component separation. *Surg Clin North Am* 2013 Oct; 93(5): 1111-33.
15. Ramirez OM, Ruas E, Dellon AL: "Components separation" method for closure of abdominal – wall defects: an anatomic and clinical study. *Plast Reconstr Surg* 1990 Sep; 86(3): 519-26.1.
16. Timmermans L, de Goede B, van Dijk SM et al.: Meta-analysis of sublay versus onlay mesh repair in incisional hernia surgery. *Am J Surg* 2014 Jun; 207(6): 980-88.
17. Pauli EM, Wang J, Petro CC et al.: Posterior component separation with transversus abdominis

release successfully addresses recurrent ventral hernias following anterior component separation.

Hernia 2015 Apr; 19(2): 285-91.

18. *de VriesReilingh TS, van Goor H, Charbon JA* et al.: Repair of giant midline abdominal wall hernias: “components separation” technique versus prosthetic repair: interim analysis of a rando-

mized controlled trial. *World J Surg* 2007; 31: 756-63.

19. *Jensen KK, Henriksen NA, Jorgensen LN*: Endoscopic component separation for ventral hernia causes fewer wound complications compared to open components separation: a systematic review and meta-analysis. *Surg Endosc* 2014 Nov; 28(11): 3046-52.

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