ASSESSMENT OF INFLAMMATORY RESPONSE INTENSITY IN EARLY POSTOPERATIVE PERIOD IN PATIENTS AFTER HERNIOPLASTY OPERATED ON WITH CLASSIC STOPPA METHOD AND VIDEOSCOPIC TEP METHOD

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The aim of the study was comparison of inflammatory response intensity through estimation of CRP, IL-6 and WBC concentration in blood serum in patients before and after inguinal hernia operations with Stoppa and TEP method.

Material and methods. The study involved 117 patients operated on inguinal hernia between 2006-2008. The patients were divided into two groups. In the first group (group I – 56) Stoppa’s method was used, in the second (group II – 61) TEP method. The patients selection was coincidental. All examined patients were men between 25-75 years old (mean age 54.3). Moreover, the operation’s time, state of postoperative wound, the average hospitalization time and intensity of pain were estimated. The observations were directed over two weeks after operation.

Results. The inflammatory response estimated with CRP, IL-6 concentration in blood serum was considerably higher in patients operated with Stoppa method. There wasn’t observed a relevant difference in increase of white blood cells’ concentration in both groups. Moreover, the patients operated on with TEP method experienced lower pain. In group, operated on with Stoppa method, 3 cases of wound healing complications were observed. The operation’s time was considerably shorter in the first group. The hospitalization time, was considerably shorter in patients operated on with videoendoscopic method.

Conclusions. The operation of inguinal hernia with TEP technique in comparison with Stoppa method is connected with considerably lower inflammatory response of organism, what directly involve with postoperative pain abridgment and reduction of hospitalization time. Moreover it may have influence on frequency of postoperative complications related with wound healing.

Key words: inguinal hernia, inflammatory response, TEP, Stoppa technique

Inguinal hernioplasty procedures are some of the most commonly performed surgeries. The odds of developing inguinal hernia are 27% in males and 3% in females (1). The common incidence of this disease entity has impacted significantly the evolution of surgical techniques, enforcing from modern medicine the creation of effective methods of hernia treatment, being at the same time least burdensome for the patient.

The precursors of modern approach to surgical hernia treatment are recognised to be Bassini and Halsted who at the end of the 19th century presented their original surgical tech-
niques. Despite numerous modifications of those methods, the number of recurrence cases post the original surgery have stood at a dozen or so per cent, while post the re-surgeries at several dozen per cent. Only the hernioplasty by Shouldice method has been associated with lower percentage of postoperative complications and is still considered even today as one of the best classical techniques of inguinal hernioplasty (2, 3).

Since 1959, i.e. since the time of introduction by Usher of polypropylene mesh in the surgical treatment, a new era in the search for new techniques based on managing hernias with the use of synthetic implants (4).

In 1964, Stoppa presented his own method of treating inguinal hernia, consisting in the placing the mesh in the preperitoneal space through the medial inferior access. This method has proven effective in the treatment of extensive inguinal hernias, including mainly recurrent hernias and abdominal hernias. The above technique has found many proponents not only in France and has been applied in selected cases to date (5).

Drawing on the idea of tension-free inguinal hernioplasty with the use of synthetic materials, in 1984, Lichtenstein proposed the closing of hernia opening with a mesh placed on the posterior wall of the inguinal canal (6). The use of this technique together with subsequent modifications by Gilbert and Rutkow, Robinson has reduced the incidence of inguinal hernia recurrence to approx. 1% (7, 8).

Since 1987, when Mouret performed the first laparoscopic cholecystectomy, we have been witnessing intensive progress in video-scoptic techniques. The benefits stemming from the use of low-invasive methods, such as the reduction of perioperative pain, good cosmetic results and reduction of hospitalisation and inability to work periods with simultaneous low incidence of postoperative complications, have contributed to the search for new uses of videoscopy also in inguinal hernia surgery. Drawing on the experience of Stoppa, in the early 1990s, Ger, Gazayerli and Arrequi presented a laparoscopic hernioplasty technique: Trans Abdominal Peritoneal Procedure (TAPP). The procedure consists in the closure of hernia opening from the peritoneal side upon prior incision and separation of parietal peritoneum (9). In 1993, McKernan and Laws presented the Totally Extraperitoneal Procedure (TEP) (10). In this method, the scope of separated tissues is the same as in alloplasty by the Stoppa method. The only difference consists in the manner of gaining operating access. In the opinion of many authors, the use of this technique enables the reduction of complication incidence. Today, the TEP and TAPP methods are the most commonly used video-scoptic techniques in inguinal hernioplasty.

Presently, having available a number of surgical techniques using various modes of gaining operating access, the procedures have started to be used not only as a therapeutic method but also as interference in the patient’s body disturbing the existing homeostasis. Operating injury in consequence of surgical interference induces inflammatory response in the patient, which might have a significant effects on the body operated on during the postoperative period. It seems natural to compare two corresponding techniques: TEP and Stoppa, differing only in the mode of gaining operating access, and in particular their impact on the intensity of inflammatory response in patients undergoing surgery due to inguinal hernia.

The aim of this study was the evaluation of CRP, IL-6 and serum leukocyte counts in patients prior and post inguinal hernia surgery by the Stoppa and TEP methods. In addition, there were evaluated the procedure duration, condition of postoperative wound, intensity of pain and mean hospitalisation period.

MATERIAL AND METHODS

The study involved 117 patients who underwent surgery due to inguinal hernia in the years 2006 – 2008. The patients were divided into two groups, homogeneous in terms of age, gender, body weight and BMI. In the first one (group I – 56) the Stoppa method was used, while in the second one (group II – 61) – TEP. The patients were randomised to the groups. All the studied males were aged 25-75 (mean age: 54.3).

The study excluded patients with symptoms of respiratory tract, gastrointestinal tract or urinary tract infections, tooth or skin abscesses, and patients who developed perioperative complications such as conversion, inferior epigastric artery injury, other perioperative haemorrhage, e.g. from the vesical venous plexus, opening in the peritoneum or the her-
nia sac, extensive subcutaneous emphysema. The patients operated on did not receive immunosuppressants, antibiotics or chemotherapeutic agents.

All the patients operated on in both groups had been given general anaesthesia. The procedure duration did not exceed 100 minutes. In the perioperative period, prophylactic antibiotic therapy was used for one day. The patients in both groups received analgesics (Ketoprofenum 3 x 100 mg p.o.) as a standard.

Patients for inguinal hernia surgery qualified to the studied groups were admitted as planned, on the day before the procedure. All patients granted their informed consent to the procedure. Three determinations of IL – 6 and CRP levels and WBC counts were performed at 24 h before the surgery and 12 h and 24 h post the surgery. CRP was determined using the reagent test Flex – RCRP with the use of particle-enhanced turbidimetric immunoassay (PETIA). Plasma IL-6 was determined by the Quantitative immunoenzymatic test. WBC counts were determined with the use of EDTA test. Pain intensity was determined on day 1 post surgery with the use of score scale: Visual Analogue Pain Score (VAPS). In addition, there was evaluated the procedure duration, condition of the postoperative wound and mean hospitalisation period. The follow up was conducted for two weeks post surgery.

The statistical analysis of data for IL-6, CRP and WBC was performed by means of the Student's t-test. The other parameters were analysed with the use of two-means test – the significance test used to analyse the equality of two means in two populations of normal distribution.

RESULTS

The obtained CRP, IL-6 and WBC results are presented in tab. 1.

The mean procedure duration was significantly shorter in the group of patients from group I and was 55 min (40-95 min), as compared with group II – 71 min (47-89 min) (p < 0.05).

The mean hospitalisation period was significantly shorter in patients from group II and was 3.05 days, as compared with group I – 5.1 days (p < 0.05).

In three patients from group I, there was found complication in the form of wound suppuration, which constituted 2.6% of all the studied patients.

Less intense pain on day 1 post surgery was reported by patients post the TEP procedure (mean score for postoperative pain VAPS – 1.25) than Stoppa (mean score for postoperative pain VAPS – 3.2) (p < 0.05).

DISCUSSION

Classical methods of inguinal hernioplasty have not met all the expectations and the surgeons have searched for developing methods with the use of which a smaller percentage of

<table>
<thead>
<tr>
<th>Means values</th>
<th>24 h prior to the procedure</th>
<th>12 h post the procedure</th>
<th>24 h post the procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>CRP</td>
<td></td>
<td></td>
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<tr>
<td>group I</td>
<td>1.36 mg/l (0.5-2.9 mg/l)</td>
<td>10.945 mg/l (5.8-15.8 mg/l)</td>
<td>21.305 mg/l (16.2-25.8 mg/l)</td>
</tr>
<tr>
<td>group II</td>
<td>1.2 mg/l (0.2-2.2 mg/l)</td>
<td>5.84 mg/l (1.3-12.3 mg/l)</td>
<td>12.2 mg/l (6.4-16.1 mg/l)</td>
</tr>
<tr>
<td>Statistical relation for the CRP level</td>
<td>p&gt;0,05</td>
<td>p&lt;0,05</td>
<td>p&lt;0,05</td>
</tr>
<tr>
<td>IL-6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>group I</td>
<td>0.97 pg/ml (0.6-1.3 pg/ml)</td>
<td>5.765 pg/ml (3.9-7.9 pg/ml)</td>
<td>14.99 pg/ml (12.1-21.8 pg/ml)</td>
</tr>
<tr>
<td>group II</td>
<td>0.85 pg/ml (0.4-1.3 pg/ml)</td>
<td>5.12 pg/ml (3.6-8.5 pg/ml)</td>
<td>11.7 pg/ml (9.8-13.9 pg/ml)</td>
</tr>
<tr>
<td>Statistical relation for the IL-6 level</td>
<td>p&gt;0,05</td>
<td>p=0,05</td>
<td>p=0,05</td>
</tr>
<tr>
<td>WBC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>group I</td>
<td>6.5 x 10^9/l (4.4-8.3 x 10^9/l)</td>
<td>9.6 x 10^9/l (5.9-11.6 x 10^9/l)</td>
<td>10.7 x 10^9/l (6.1-13.2 x 10^9/l)</td>
</tr>
<tr>
<td>group II</td>
<td>7.1 x 10^9/l (4.3-8.7 x 10^9/l)</td>
<td>9.3 x 10^9/l (6.1-12.0 x 10^9/l)</td>
<td>11.1 x 10^9/l (7.2-13.4 x 10^9/l)</td>
</tr>
<tr>
<td>Statistical relation for the WBC count</td>
<td>p&gt;0,05</td>
<td>p&gt;0,05</td>
<td>p&gt;0,05</td>
</tr>
</tbody>
</table>
recurrence might be observed and quicker restoration of patients to full physical health. The introduction of biomaterials has created new possibilities in the treatment of hernias, and the Lichtenstein procedure set new standards of treatment. Despite the considerable progress that have occurred since the time of introduction of synthetic implants and development of various inguinal hernioplasty techniques with the use of mesh, the patients undergoing surgery have complained of pain in the inguinal region persisting even for 4 weeks post surgery. The above problem concerned mainly alloplasty procedures with anterior access (Lichtenstein, Rutkow, Gilbert procedures) (11, 12). The above complaints have most likely been caused by the disruption of tissue continuance in the inguinal canal and separation of the spermatic cord.

The opinions on the effectiveness of inguinal hernioplasty keep changing. The application in the early 1990s of the videoscopic technique in inguinal hernia surgery fulfilled many of the patient’s expectations and opened new possibilities for surgeons. However, the idea of videoscopic hernioplasty did not concern only the mode of gaining access itself but also the manner of hernia management. The mesh was placed on the side of peritoneum, tension-free, extensive skin incisions, incision on the abdominal external oblique muscle and extensive separation of the spermatic cord were eliminated. All the above elements were to contribute to the reduction in pain and postoperative complications.

In the evaluation of clinical value of preperitoneal alloplasty methods of Stoppa and TEP, there should be mentioned overall advantages and disadvantages of those methods. The preperitoneal alloplasty advantages include good visibility of all hernia openings, which makes the hernia assessment easier. Another element is the minimal likelihood of damaging the abdominal organs located intraperitoneally, as well as small risk of collision with the inguinal nerves. Another advantage of the preperitoneal technique is the enforcement of the entire posterior wall of the inguinal canal. Avoidance of separation within the peritoneum allows to avoid the possibility of postoperative adhesions. The absence of the need of immobilising the mesh constitutes a big facilitation during the procedure and lowers the costs of the procedure (10).

The disadvantages of preperitoneal alloplasty include the limited possibility of creating working space due to the presence of integumental adhesions in patients post prior injury or procedure in the same region. Perioperative damage of iliac vessels, vesical venous plexuses or bladder perforation might constitute a serious complication which might even cause patient’s death during the perioperative period (10). In practice, complications of this type occur extremely rarely.

The performance of the procedure by videoscopic method is limited by the prolonged surgeon training, which constitutes a significant problem in its popularisation. Inguinal hernia surgery requires very good anatomic knowledge and experience in the use of videoscopic techniques.

An important argument in favour of preperitoneal alloplasty was the study by Horgan published in 1996, in which the author studied the susceptibility of tissues to mechanical stretching and demonstrated that their resistance is significantly higher post the implantation of the mesh on the peritoneal side than in the alloplasty with anterior access. The above difference was being explained by the fact of broader adherence of the mesh in relation to the hernia opening, and the contact of mesh with peritoneum was supposed to facilitate the formation of a stronger connective tissue adhesion and thus a better stabilisation of the biomaterial within tissues (13).

Many authors compare videoscopic surgery with corresponding procedures performed by the open technique. The majority of such publications unanimously emphasise the advantages stemming from the use of videoscope. These advantages include reduced pain in the postoperative period, smaller number of complications affecting the wound (haematoma, abscess, mesh infection) and quicker restoration of full physical health. This is being explained by smaller invasiveness and higher precision of those procedures. Currently, it is possible to assess quite precisely the level of invasiveness of individual surgical techniques through the determination of intensity of the inflammatory reaction of the body in response to the perioperative injury (14, 15). The use of low-invasive techniques, also in inguinal hernioplasty, causes weaker inflammatory response of the body to the inflicted injury. This phenomenon is directly correlated with
smaller incidence of postoperative complications and with the shortening of hospitalisation period, and thus it affects the quality of life of patients undergoing surgical interventions.

Summing up, the comparison of the open technique by Stoppa method with the video-scopic alloplasty TEP was in favour of the low-invasive technique. The inflammatory response evaluated by the serum levels of IL-6 and CRP was significantly more intensive in patients undergoing open alloplasty. No significant difference was observed in the increase in blood leukocyte counts between the studied groups. The patients post the Stoppa procedure experienced stronger pain and wound healing occurred with stronger inflammatory reaction than post the TEP procedure. In three cases (2.6%), in the postoperative course after open alloplasty, wound suppuration occurred, resulting in prolongation the mean hospitalisation period.

CONCLUSIONS

The procedure of video-scopic inguinal hernioplasty by the TEP technique as compared with the classical Stoppa method is associated with significantly lower intensity of inflammatory response of the body, which is directly associated with reduced pain associated with surgery and with the shortening of hospitalisation period, as well as may have impact on the lowering of the incidence of postoperative complications associated with wound healing. Despite this, preperitoneal alloplasty by Stoppa method should not be unambiguously discredited, since it still constitutes an interesting alternative to inguinal hernioplasty with anterior access.

REFERENCES