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The use of autologous fascia lata graft in the laparoscopic reinforcement of large hiatal defect: initial observations of the surgical technique

Working title:

The use of fascia lata graft in reinforced hiatal repair

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Abstract

**Background:** Even though there is no consensus, many authors believe that in the cases of large hiatal defects, structurally altered crura and/or absence of peritoneal lining, a crural reinforcement should be performed. Reinforcement could be performed with different techniques and different type of mesh, either synthetic or biologic. The disadvantages of mesh repair include possibility of serious complications and increased costs especially in usage of composite or biologic mesh.

**Methods:** The study include 10 cases of reinforced primary suture line of the pillars with autologous fascia lata, in elective laparoscopic repair of the giant PEH with large hiatal defect and friable crura. After intraoperative confirmation of the large hiatal defect (hiatal surface area of more than 8cm²) and friable crura, autologous fascia lata graft was harvested in a usual manner and placed in on-lay fashion to reinforce the pillar suture line. We analyzed surgical technique, complications, and initial follow-up of the patients.

**Results:** Average hiatal surface area (HSA) in our series was 10.6 cm² (range 8.1 to 14.4cm²). The average duration of operation was 203.9 min/3.4hours (range 160 – 250 min). Except mild hematoma in the harvesting region, that resolved spontaneously, there were no procedure related complications and the 30 days mortality rate was zero. Average postoperative length of stay was 6.5 days (5 – 8 days). Out of 10 patients, 5 completed the annual follow-up visit, while 3 completed 6 months follow-up visit. So far there is no hernia recurrence and/or problems with swallowing function. However, one patient feel mild discomfort in the harvested region, that does not influence normal daily activities.
**Conclusions:** Autologous fascia lata graft hiatal reinforcement represent technically feasible, easy, and available option for on-lay reinforcement of the large hiatal defects with friable crura in the laparoscopic repair of giant PEHs.

**KEY WORDS:** fascia lata, hiatal hernia, recurrence, reinforcement, tissue transfer
Background

Several studies had addressed that after retroesophageal crusoraphy in the case of giant paraesophageal hernia (giant PEH), recurrence rates could be expected in up to 43% cases [1, 2]. There are two main technical causes of recurrent hiatal hernia: unrecognized secondary shortened esophagus and insufficient hiatal closure. Even though there is no consensus, many authors believe that in the cases of large hiatal defects, structurally altered crura and/or absence of peritoneal lining, a crural reinforcement should be performed. Several technical options were proposed; amongst them the use of mesh reinforced hiatoplasty. However, there is still a pending question regarding mesh-related complications [3]. Another issue is the mesh costs, as well as issue of using heterologous tissue transfer in the case of biologic mesh usage [4].

In 2012, a group from Pecs, Hungary, offered a biologic alternative by performing fascia lata graft hiatoplasty on animal model [5]. Back in 1931 Janes published the use of autologous fascia lata graft in the treatment of posttraumatic diaphragmatic hernia [6]. In 1968, Brain published the use of autologous fascia lata graft to create new phrenoesophageal ligament in the transthoracic repair of hiatal hernia [7]. At our Department, first use of autologous fascia lata graft to reinforce primary suture of the pillars in the case of large hiatal defect with friable crura was performed in April 2013. In this series we present a biologic hiatal reinforcement with autologous fascia lata graft as a technically feasible, easy, and available option for reinforcing large hiatal defects with friable crura in laparoscopic repair of giant PEH.
Methods

The study included 10 patients with giant PEH and large hiatal defect with friable crura, who underwent elective laparoscopic hiatal hernia repair in the Department for Minimally Invasive Upper Digestive surgery, Clinic for Digestive Surgery, Clinical Center of Serbia in Belgrade from April 2013 to November 2014.

Written informed consent was obtained from all patients prior to surgical intervention. All patients underwent standard surgical technique of giant PEH repair [8]. After intraoperative confirmation of the large hiatal defect (hiatal surface area of more than $8\text{cm}^2$) and friable crura, autologous fascia lata graft was harvested in a usual manner and placed in on-lay fashion to reinforce the pillar suture line.

Control barium radiography was routinely performed on the first postoperative day followed by clear liquid diet, with exception of patients who underwent esophageal lengthening procedure when barium radiography was performed on the postoperative day five. After hospital discharge, the first check-up was performed a month after surgery. Then, six months after surgery symptom evaluation and contrast radiography with barium meal have been performed. The standard post-operative annual check-up included symptoms evaluation, contrast radiography with barium meal and upper flexible endoscopy.

Surgical technique

Patient was placed in a supine position with trocar position adopted from J.D. Luketich [9]. Procedures started with complete reduction of hernia and sac excision. Next step was extensive mediastinal esophageal dissection with vagal preservation. Gastroesophageal junction fat pad was dissection, with intraoperative evaluation of
esophageal length in a tension free manner, and wedge gastropasty in the case of
the secondary shortened esophagus [8]. Antireflux procedure included a total 360°
floppy Nissen fundoplication using 2-0 non-absorbable interrupted sutures. Size of
hiatal defect was assessed by intraoperative measurement of hiatal surface area
(HSA) [10]. HSA of more than 8cm² with friable crura was indication for fascia lata
reinforcement.

Autologous fascia lata graft was harvested from right thigh of the patient. The incision
was placed at the line that connects lateral tibial epicondyle and femoral greater
trochanter approximately 5cm above lateral tibial epicondyle (Figure 1). Afterwards,
the careful dissection was performed with special attention to avoid the injury of
ileotibial tract. The harvested autologous fascia lata graft measured approximately
10x8 cm in diameter. The meticulous hemostasis was performed in which
coagulation of perforator veins was mandatory. The subcutaneous drainage was
optional, based on the assessment of the operating surgeon and afterwards the
wound reconstruction was performed. The autologous fascia lata graft was placed in
sterile saline solution.

Primary retroesophageal suture of the pillars was performed. For severely disrupted
hiatus, a complex reconstruction is required. In such a case the left crus is plicated
to normalize crural length, permitting a standard hiatal reconstruction [11].
Afterwards, a „U“ shaped autologous fascia lata graft was placed in on-lay fashion
and fixed with biodegradable tacks (Figure 2).

**Results**
The outcomes of 10 cases of laparoscopic repair of the giant PEH along with
autologous fascia lata graft hiatoplasty from April 2013 to November 2014 were
included. Demographic details, surgical procedure and postoperative course related details were listed in the Table 1.

The series included 2 (20.0%) males and 8 (80.0%) females. Mean age was 64.2 years (range 39 to 79 years). Average Karnofsky score was 87 (range 80 – 90) and ASA score was 1.8 (range 1- 3). Average BMI in the selected patients was 28.3 kg/m$^2$ (range 20.57 – 41.62 kg/m$^2$). Out of 10 patients with giant PEH, 5 (50%) were presented with chronic gastric volvulus. Due to the secondary short esophagus in 2 (20.0%) patients esophageal lengthening procedure had to be performed. Average hiatal surface area (HSA) in our series was 10.6 cm$^2$ (range 8.1 to 14.4cm$^2$). In 3 (30.0%) patients primary crural repair was performed with retroesophageal cruroraphy using 0 non-absorbable interrupted sutures and in 7 (70.0%) patients left crus was plicated to normalize crural length, permitting a standard hiatal reconstruction. Intraoperative complications included iatrogenic pneumothorax in one patient which was resolved with chest tube. The average duration of operation was 203.9 min/3.4hours (range 160 – 250 min).

The subcutaneous drainage was placed in 9 (90.0%) out of 10 patients. Mean duration of the drainage was 3 days (range 2 to 4 days). The was no wound infection. A patient with no subcutaneous drainage had mild hematoma in the harvested region that resolved spontaneously. One patient had exacerbation of the chronic obstructive lung disease. Appart from that, there were no other postoperative complications. Average postoperative length of stay was 6.5 days (5 – 8 days). Hospital and the 30 days death rate was zero.

Out of 10 patients, 5 completed the anual follow-up visit, while 3 completed 6 months follow-up visit. There were no problems with swolowing function. So far there is no
symptomatic and/or radiologic recurrence. However, one patient feel mild discomfort in the harvested region, that does not influence normal daily activities.

Discussion

Resolving large hiatal defect still remains a challenge. The primary retroesophageal suture of the diaphragmatic pillars remained mainstay of practice for many years [9, 12]. Even though there is no consensus, many authors believe that in the cases of large hiatal defects, structurally altered crura and/or absence of peritoneal lining, a crural reinforcement should be performed [13].

Several technical options were proposed; amongst them the use of mesh reinforced hiatalplasty. The mesh reinforced hiatalplasty could be performed as an on-lay repair or interposition repair using different types of synthetic mesh i.e. polypropylene, polyester, polytetrafluoroethylene (PTFE) or the combination more suitable for intraperitoneal use [14]. The disadvantages of mesh reinforced hiatalplasty include possibility of serious complications and also increased costs especially in usage of PTFE or composite types [15]. The most novel biologic meshes cause fewer complications. However, they adhere less than synthetic ones with a possibility of mesh migration. In addition, there are more expensive than synthetic and have all issues regarding transfer of heterologous tissue [4].

Recently, a group from Pecs, Hungary, offered a biologic alternative by performing fascia lata graft hiatalplasty on animal model [5]. After macroscopic and microscopic evaluation of fascia lata patches after 6 month follow-up period there were no signs of inflammation, abscedation or extensive scar tissue formation. All fascia lata patches were organized and incorporated in scar tissue increasing tissue strength.
Also, the shrinkage was up to 20% (only on sides), the neovascularization arriving from diaphragmal blood vessels and peritoneal integration was observed [5].

The first use of autologous fascia lata graft in the treatment of posttraumatic diaphragmatic hernia was published by Janes in 1931 [6]. In 1968, Brain et al. published the use of autologous fascia lata graft to create new phrenoesophageal ligament in the transthoracic repair of hiatal hernia [7]. Autologous fascia lata graft had been used in thoracic surgery for reinforcement of stapled lung resection with excellent results [16].

Encouraged by these results, in our Department we performed 10 laparoscopic autologous fascia lata graft hiatal reinforcements in the patients with giant PEHs and large hiatal defect with friable crura. The procedure of harvesting autologous fascia lata graft is not technically demanding. It is expected that the main disadvantage of this surgical procedure is cosmetic and included a scar on the thigh. In addition, procedure could cause postoperative pain. However, in one case (with no subcutaneous drainage) mild hematoma occurred and successfully resolved spontaneously. We are not sure whether the discomfort in that specific case was related to the hematoma or procedure itself. No lower limb malfunctioning was observed. It has to be kept in mind that the average age of the patients in our series was 64.2 years. Thus, we could not speculate about the functional result in younger and more active patients. Nevertheless, average age in this small series does not differ significantly from average age in the series of 65 giant PEH repairs we performed so far. Indeed, the average age of the patients with giant PEH treated in other series is even higher [9].

Regarding hiatal hernia features, in our series all patients had giant PEH with at least 1/3 of the stomach positioned intrathoracaly [9]. Five patient presented with chronic
gastric volvulus. Average HSA area in our series was 10.6 cm$^2$. After performing primary suture of the pillars by using 0 non-absorbable interrupted sutures we placed 10x8 cm „U“ shaped autologous fascia lata graft in on-lay fashion. The patches of autologous fascia lata should be placed in on-lay fashion after cruroraphy, because tension strength of the graft, to our opinion, is not sufficient for interposition repair [5]. For the graft fixation we used biodegradable tacks. Based on the animal model, if the initial fixation is good, there is no danger of patch migration after complete scar tissue organization [5].

Except mild hematoma that resolved spontaneously, there were no procedure related complications and the 30 days mortality rate was zero.

Out of 10 patients, 5 completed the annual follow-up visit, while 3 completed 6 months follow-up visit. So far there is no recurrence and/or problems with swallowing function. However, one patient feel mild discomfort in the harvested region, that does not influence normal daily activities.

**Conclusion**

We present a series a biologic reinforcement of the large hiatal defects with friable crura in the patients with giant PEH by using autologous fascia lata graft. For the present follow-up period, no hiatal hernia recurrence or procedure related significant complications had been observed. Autologous fascia lata graft hiatal reinforcement represent technically feasible, easy, and available option for on-lay reinforcement of the large hiatal defects with friable crura in the laparoscopic repair of giant PEHs. However, due to relatively small number of patients and short follow-up period we express the need for further evidence regarding this surgical technique.
Abreviations:

- **PEH** – paraesophageal hernia
- **PTFE** – polytetrafluoroethylen
- **HSA** – hiatal surface area

Reprint requests

Reprint requests should be directed to Prof. Milos Bjelovic on e-mail milos.bjelovic@gmail.com.

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Bjelovic Milos and Babic Tamara designed research. Bjelovic Milos, Babic Tamara, Spica Bratislav, Gunjic Dragan, Bascarevic Violeta performed research. Babic Tamara wrote the manuscript. Bjelovic Milos revised manuscript for scientific acknowledgements.

Disclosure statement

All authors stated that they do not have any financial or non-financial competing interests.

IRB approval of the protocol

This technique and study was approved by the IRB of the Clinical center of Serbia.
References


Figures

Figure 1. Harvesting region

Figure 2. Autologous fascia lata graft reinforcement of the large hiatal defect; fascia lata in place

Tables

Table 1. Demographic, surgical procedure and postoperative course details

<table>
<thead>
<tr>
<th>Features</th>
<th>No (%)</th>
<th>Average (range)</th>
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<tbody>
<tr>
<td>Gender</td>
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<td></td>
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<tr>
<td>Males</td>
<td>2 (20.0%)</td>
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<tr>
<td>Females</td>
<td>8 (80.0%)</td>
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<tr>
<td>Age</td>
<td>64.2 years (39 – 79 years)</td>
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<tr>
<td>Karnofski score</td>
<td>87 (80 – 90)</td>
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<td>ASA score</td>
<td>1.8 (1 - 3)</td>
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<tr>
<td>BMI</td>
<td>28.3 kg/m² (20.57 – 41.62 kg/m²)</td>
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<tr>
<td>Hernia type – Giant PEH</td>
<td>10 (100%)</td>
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<tr>
<td>Chronic gastric volvulus</td>
<td>5 (50%)</td>
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<tr>
<td>HSA</td>
<td>10.6 cm² (8.1 – 14.4 cm²)</td>
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<tr>
<td>Esophageal lengthening procedure (Collis)</td>
<td>2 (20.0%)</td>
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<tr>
<td>Primary suture of the pillars</td>
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<tr>
<td>Plication of the left crus</td>
<td>7 (70.0%)</td>
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<tr>
<td>Drainage in the harvesting region</td>
<td>9 (90.0%)</td>
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<tr>
<td>No of days</td>
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<td>Duration of the operation</td>
<td>203.9 min (160 – 250 min)</td>
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<tr>
<td>Postoperative complications</td>
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<td>Mild hematoma on the right thigh</td>
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<tr>
<td>Length of postoperative hospital stay</td>
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<td>30-days death rate</td>
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<td>Follow up period</td>
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<td>12 months</td>
<td>5 (50.0%)</td>
<td></td>
</tr>
<tr>
<td>6 months</td>
<td>3 (30.0%)</td>
<td></td>
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<tr>
<td>Recurrence rate</td>
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<td>0%</td>
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