Original Article

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Omentopexy for patch repair of diaphragmatic defect

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ABSTRACT

Background: There are many techniques in the reconstructive of congenital diaphragmatic hernia defect. In this study, we present our results from a prospective, randomised trial of using the omentum (omentopexy) for repair of large diaphragmatic defects. **Materials and Methods:** Twenty white, male, New Zealand rabbits were used to compare incidence and severity of adhesion bands formation in abdominal cavity with/without of omentopexy after repair of diaphragm defect with the non-absorbable patch (Dacron). They were divided in to two groups, GI (10 animals with omentopexy and repair) and GII (10 animals with repair, without omentopexy). On the 60th day, animals were re-operated. In each case, adhesion band formation and its severity were recorded. **Results:** The difference between the incidence of adhesion band formation among the two group was statistically significant (P = 0.019).The majority of rabbits in GII (60%) had substantial adhesion bands (Grade >2 or severe score), whereas, in GI, none of rabbits had substantial adhesion bands (P = 0.019). **Conclusion:** Our study showed that the use of omentopexy as a cover in repair of diaphragmatic defect is versatile technique with a good success for decreasing of adhesion band formations at short-term follow-up.

Key words: Adhesion bands, congenital diaphragmatic hernia, omentum, patch

INTRODUCTION

There are many techniques in the reconstructive armamentarium of the paediatric surgeons to repair congenital diaphragmatic hernia (CDH) defect. These include, primary closure, non-absorbable or absorbable patch closures and latissimus muscle flap repair.[1-4] However, there is still controversy over the best means of CDH defect repair and superiority of one technique over another has not yet been clearly defined.

Based on the 30-50% recurrence rates reported following patch closure[5] and inaccessibility of non-absorbable artificial materials such as Dacron or GorTex or bioactive materials in every centre, in this study, we present our results from a prospective, randomised trial of using the omentum (omentopexy) for repair of large diaphragmatic defects.

MATERIALS AND METHODS

Local research ethics committee and veterinary board of university approved the study. Between January 2010 and January 2011, 20 white, male New Zealand rabbits (Razi institute, Tehran, Iran), weighting 1500-2600 g were used to compare incidence and severity of adhesion bands formation in abdominal cavity with/without of omentopexy after repair of diaphragm defect with non-absorbable patch (Dacron). Animals were identified by numbering from 01 to 20, tattooed on the internal face of the right ear. The rabbits were kept in a controlled environment (temperature: 24-26ºC, humidity: 55-65%, fed a commercial pellet diet (Niro-Sahand Co., Tabriz, Iran) and allowed freely access to tap water until 4 h before surgery, when feeding was discontinued.

They were divided in to two groups (odd as GI, evens as GII).

GI: 10 animals with omentopexy and repair.
GII: 10 animals with repair, without omentopexy.

Technique

All operations were performed by a team of two surgeons. Anaesthesia was done with intramuscular

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premedication of 2 mg/kg body weight Xylazine associated with 40 mg/kg body weight ketamine intramuscularly.

Then, the animal was placed in a horizontal dorsal decubitus on the surgical table and its paws fixed to the extremities of the table with thin ropes. With electrical clipper, abdominal hairs were shaved from the region abdominis cranialis and media, at the site of surgery.

Antisepsis of the surgical site was performed with 2% iodinated alcohol solution.

Median laparotomy was performed, starting 1 cm below the processes xiphoideus, in caudal direction with 4 cm extension. After exteriorisation of intestinal loops, left diaphragm was located and a 5 cm × 5 cm defect made in its central region.

For defect repair, a wide (6 cm × 6 cm) Dacron patch (surgical mesh™, USA) was sutured to one side of the defect line using 3-0 prolen sutures continuously. We were careful to put the patch under stretch to avoid redundancy. In GI, the patch was covered by the omentum tissue. For this purpose, a leaf of omentum was dissected free by ensuring vascular contact to the remaining omentum [Figure 1] and anastomosed to edges of diaphragm and patch to cover non-absorbable material completely.



Figure 1: Substantial adhesions bands in one rabbit of GII

The abdominal incision was closed in the anatomical way and the animals were allowed to recover from anaesthesia.

Post-operatively, animals were kept in controlled environment for 60 days. On 60th day, animals were re-operated as the first operation by third surgeon who was unaware of the allocation of the study participants. In each case, adhesion bands formation and its severity were recorded according to the Nair classification[6] [Table 1]. We also resected some area of adhesions for histological assessment. The results were analysed by using Mann-Whitney *U*-test. Adhesion grades were compared by Chi-square test. Statistical analyses were performed by using the SPSS 11 (SPSS, Chicago, IL. USA). $P < 0.05$ is considered to be significant.

RESULTS

The groups were similar in age and sex (male). There were 10 rabbits in each group. All rabbits survived until the end of study. The mean body weight of rabbits was 1234.4 ± 188.7 g. There was no significant difference between the groups regarding the body weight. Table 2 compares the adhesion band grades of GI-GII rabbits. The majority of rabbits in GII (60%) had substantial adhesion bands (Grade > 2), whereas, in GI, none of rabbits had substantial adhesion bands ($P = 0.019$).

Table 3 shows the overall incidence of adhesion band formation in groups. Overall, the difference between the incidence of adhesion band formation among the two group was statistically significant ($P = 0.019$).

DISCUSSION

Although the absorbable artificial materials have many advantages as a cover for repair of diaphragm in CDH, but they are so expensive and inaccessible in some of paediatric surgery operating rooms. On the other hand, peritoneal adhesion band formation is the consequence of inflammatory reactions after non-absorbable mesh hernioplasty.[7] Fibroblast proliferation and secretion of collagen probably were involved in the pathogenesis of adhesion bands.[8] Based on wide range of adhesion

Table 1: Nair classification

Grade	Description of adhesive bands	Remarks
0	Complete absence of adhesions	Insubstantial adhesions
1	Single band of adhesions between viscera, or from one viscus to abdominal wall	
2	Two bands, either between viscera or from viscera to the abdominal wall	
3	More than two bands, between viscera, or viscera to abdominal adhesions wall, or whole of intestines forming a mass without being adherent to abdominal wall	Substantial adhesions
4	Visceral directly adherent to abdominal wall, irrespective of number and extent of adhesive bands	

Table 2: Adhesion grades in rabbits

Adhesion grade/Group	Group I	Group II	Total
0	6	1	7
1	4	3	7
2	0	2	2
3	0	4	4

Table 3: Adhesion band formation in rabbits

Adhesion band/group	Group I	Group II	Total
+	4	9	13
−	6	1	7

bands formation reported following patch closure; however, the ideal preventive protocol has not yet been proposed.

Our findings showed that omentopexy not only markedly reduce severe adhesion bands formation in rabbit model, but also loosen the bands. To the best of our knowledge, this is the first study of omentum use for these purposes. It is difficult to conduct randomised trials in omentopexy in human because, re-laparotomy is a major limitation of the study, therefore, we tried to work with as homogenous a group of rabbits as was possible.

St Peter *et al.*, found that absorbable patches had significantly less adhesion bands than non-absorbable patches in repair of CDH. Of course, the recurrence rate was similar in groups.[8]

We were meticulous during the omentopexy, making sure to put the omentum under stretch during anastomosis to avoid redundancy and subsequent contact of Dacron to bowels. It seems that low grade adhesion bands formation in GII can be explained by lapratomy process that is unpreventable in most studies.

Laituri[5] reported 19% and 40% incidence of small bowel obstruction with small intestinal submucosa (SIS) and Allo-Derm hernioplasty respectively. Although this study is a retrospective review based on the clinical findings, but it seems that omentopexy results can be comparable with absorbable materials results in CDH repair, however, this conclusion should be established in another study.

CONCLUSION

Our study showed that the use of omentopexy as a cover in repair of diaphragmatic defect is versatile technique with a good success for decreasing of adhesion bands formation at short-term follow-up.

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