International Journal of Healthcare Sciences ISSN 2348-5728 (Online)
Vol. 4, Issue 2, pp: (529-533), Month: October 2016 - March 2017, Available at: www.researchpublish.com

Efficiency of Use Biological Mesh over Synthetic Mesh in Hernias Repair; Systematic Review

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Abstract: **Biological grafts are derived from human, bovine, and porcine tissue that has actually been decellularized to leave a collagen matrix. This structure serves as a regenerative structure that supports renovation and brand-new collagen deposition. Permanent synthetic meshes composed of materials such as polypropylene, polyester or expanded polytetrafluoroethylene are extensively considered as ergonomically sound and long lasting options for stomach wall restoration. The aim of this methodical evaluation was to evaluate the use of various kinds of mesh which are biological mesh and artificial mesh in hernias repair, by reviewing the proof from previous research studies showing the preferable mesh usage in different countries. A literature search of the Medline database was performed using the PubMed search engine.**

The electronic databases PubMed, Ovid MEDLINE, the Cochrane Central Register of Controlled Trials, and Google Scholar were searched for potentially relevant studies by using various combinations of the search terms ‘‘Biologic mesh’’, ‘‘ventral hernia,’’ ‘‘incisional hernia,’’ ‘‘umbilical hernia,’’ and ‘‘abdominal wall reconstruction.’’ Search limitations included human studies, publication in the English language, and publication up to November 2016. Synthetic and biological meshes are widely used in surgical practice and the number of new products continues to grow. To optimize surgical outcomes, the practicing surgeon must have a thorough understanding of these products to guide proper selection and use. The heterogeneous patient population, variety of techniques employed, and large number of products available make comparisons between existing studies difficult.

Keywords: **Biologic mesh, bovine, and porcine tissue.**

1. INTRODUCTION

Abdominal wall hernias are common, with a prevalence of 1.7% for any ages and 4% for those aged over 45 years. Inguinal hernias represent 75% of stomach wall hernias, with a lifetime threat of 27% in guys and 3% in ladies [(1)]. Parastomal hernia is the most frequent issue associated with the creation of an ileostomy or colostomy [(2)]. It is defined as an incisional hernia that happens at or surrounding to the stoma [(3)]. It is almost an unavoidable issue of an ostomy development if left in location long enough, with incident rates reported approximately 56% [(2,3,4,5,6)]. Forward hernia represents among the most often experienced surgical issues in the United States, with incisional hernias alone affecting approximately 11 % of patients after major abdominal surgery [(7)].

The Guidelines of the European Hernia Society state, based upon evidence level 1 A, that operation strategies utilizing mesh lead to less reoccurrences than methods, which do not utilize mesh [(8)]. Although mesh repair appears to lower the likelihood of persistent groin pain rather than increase it [(8)], mesh can trigger substantial pain and tightness around the groin and affect physical functioning [(9)]. This has resulted in various kinds of mesh being engineered, with a growing interest in lighter weight polypropylene (PP) fits together [(9)], absorbable meshes [(10)], and biological meshes. For open inguinal hernia repair work making use of light-weight PP fits together was not associated with an increased danger of hernia reoccurrence. Light-weight PP fits together minimize the incidence of chronic groin pain as well as the risk of establishing other groin signs [(11)]. To avoid problems, making use of absorbable meshes-such as those made from lactic

acid polymer or lactic and glycolic acid copolymers-has been proposed. This exposes the patient to unavoidable hernia reoccurrence because the inflammatory reaction, through a hydrolytic response, completely absorbs the implanted prosthetic material [10, 12].

Biological mesh: Biological grafts are derived from human, bovine, and porcine tissue that has actually been decellularized to leave a collagen matrix. This structure serves as a regenerative structure that supports renovation and brand-new collagen deposition. The characteristics of each material are special and reliant on the tissue source and the specific approaches used to get rid of the cells and decontaminate the graft. The subtle biochemical modifications in the collagen structure that take place as a result of this processing affect the biocompatibility, foreign body response, and immunogenic potential of the graft [13].

Synthetic (Artificial) mesh: Permanent synthetic meshes composed of materials such as polypropylene, polyester or expanded polytetrafluoroethylene are extensively considered as ergonomically sound and long lasting options for stomach wall restoration [14,15]. Nevertheless, substantial issues consisting of mesh migration, bacterial colonization and fistula formation necessitated the development of an option [16]. The use of artificial meshes can cause of adhesions, persistent sinus (2-6%), fistula development (0-2%) and injury infections (2-17%). The advancement of biological grafts decreased the occurrence of the aforementioned complications [16,17].

The aim of this methodical evaluation was to evaluate the use of various kinds of mesh which are biological mesh and artificial mesh in hernias repair, by reviewing the proof from previous research studies showing the preferable mesh usage in different countries.

2. METHODOLOGY

Systematic review study was conducted according the guideline of reviews

Search strategy:

A literature search of the Medline database was performed using the PubMed search engine.

The electronic databases PubMed, Ovid MEDLINE, the Cochrane Central Register of Controlled Trials, and Google Scholar were searched for potentially relevant studies by using various combinations of the search terms ‘‘Biologic mesh’’, ‘‘ventral hernia,’’ ‘‘incisional hernia,’’ ‘‘umbilical hernia,’’ and ‘‘abdominal wall reconstruction.’’ Search limitations included human studies, publication in the English language, and publication up to November 2016. Titles and abstracts of all possible articles were reviewed and reference lists were examined for any additional pertinent articles. All potential studies were examined in detail to select only those papers meeting the strict inclusion criteria.

3. RESULTS AND DISCUSSION

Using mesh technique in hernias repairs:

A meta-analysis from the EU Hernia Trialists Collaboration compared mesh with sutured strategies from 58 trials making up in overall 11 174 patients [18]. Individual patient data were readily available for 6901 patients. Reoccurrence was less typical after mesh repair work (chances ratio 0.43 (95% confidence period 0.34 to 0.55)). A population based research study taking a look at risk of recurrence five years or more after main mesh (Lichtenstein repair) and sutured inguinal hernia repair work in 13 674 patients discovered that recurrence after mesh repair work was a quarter of that after sutured repair work (threat ratio 0.25 (0.16 to 0.40)) [19]. Open mesh repair is reproducible by non-specialist cosmetic surgeons, and for this reason open repair is the preferred repair work technique for primary inguinal hernia (by 96% of UK cosmetic surgeons, 99% of Japanese surgeons, 95% of Danish cosmetic surgeons, and 86% of US surgeons [20].

Types of Biological Mesh:

A) Human acellular dermal matrix was the very first biological mesh readily available, and gained prevalent appeal early in its history. Preliminary reports were promising, with good tissue incorporation and low infection rates. Most of infections were handled with local wound care, and graft elimination was needed just in 4%. However, follow-up studies revealed a high occurrence of laxity, eventration, and recurrent herniation [23,25]. Eventration appears to be a considerable problem with this biomaterial, and the quantity of stretch boosts with time. In a research study of injury patients, laxity took place in 67% of patients at 60 days, and 100% at 1 year [26].

B) Small intestinal submucosa (SIS) tissue repair products are biologic grafts created from porcine SIS. Biodesign (Cook Medical, Inc., Bloomington, IN) is available in multiple thicknesses. It has been used in contaminated fields, and seems to hold up well when the degree of contamination is minimal. However, it does not perform as well with gross contamination or when the fascia cannot be reapproximated (i.e., when it is used as a "bridge") [24].

Biological Mesh Verses Synthetic Mesh in efficiency:

Permanent synthetic meshes are vulnerable to infection, restricting their use in polluted fields. A current meta-analysis [27] revealed that the general infection rate was 5%. Danger aspects for infection consisted of smoking cigarettes, American Society of Anesthesiologists score > 3, and emergency operation. A range of artificial meshes and surgical techniques were used. There was no distinction in infection rate in between macroporous and microporous mesh, but the authors warned that there were numerous confounding aspects that precluded any solid conclusion on this concern. Mesh elimination was carried out in 70% general, and 100% of the ePTFE grafts [27].

The management of contaminated mesh depends upon the type of material included. In general, infections including polypropylene mesh can be drained pipes, with excision of exposed, unincorporated mesh (**Figure1**). Grafts using ePTFE normally have to be excised [28]. Absorbable products can be used in an infected field; nevertheless, they typically lead to fascial flaws once the product has liquefied. As they are deteriorated, they can produce thick adhesions that may complicate subsequent repair work [28].

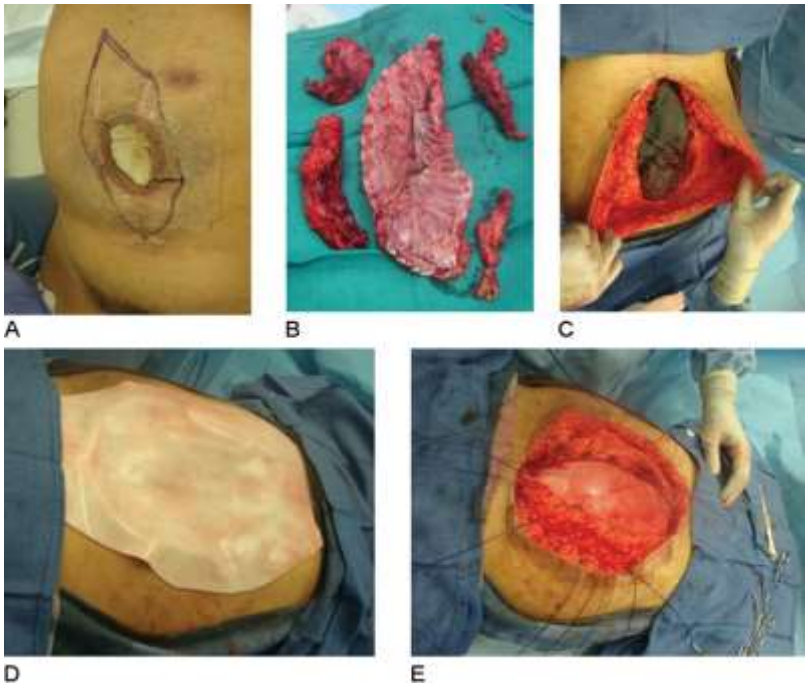

Figure1: Repair of infected synthetic mesh with biologic mesh. (A) Synthetic mesh seen eroding though skin. Outline shows mesh extension. (B) Specimen photo of excised mesh and mesh-fascial scar. (C) Facial defect prepared for biologic mesh underlay. (D) Biologic mesh measured and cut to size over defect allowing >3 cm overlap with fascia. (E) Mesh underlay with suture fixation. Fascial edges were then approximated over mesh (not pictured).

Biological mesh has actually been extensively utilized in clean-contaminated and contaminated fields, and short-term outcomes appear promising [21]. While (as expected) injury infection rates are high, graft removal is uncommon [22]. (**Figure2**) shows an exposed biologic mesh that is likely infected with skin plants, and perhaps enteric plants because the patient also had a colostomy. Mesh removal was not undertaken. Granulation tissue can be seen growing through the pores.

In three retrospective case series [29,30,31,32] with 10-38 patients, inguinal hernias were fixed in an endoscopic method (TEP, TAPP) with SIS. During a mean follow-up duration of 12-14.5 months, a recurrence rate of 2 and 9.1% was observed, respectively [29,30]. No improvement in signs was seen in one patient with a sports hernia following TEP operation with SIS [31]. In another study the biological meshes (SIS) were utilized successfully even in a potentially infected setting, i.e., with incarcerated/strangulated bowel within the hernia or coincident with a laparoscopic cholecystectomy/colectomy in addition to in a grossly polluted field (i.e., gross pus or fecal spillage) [32].

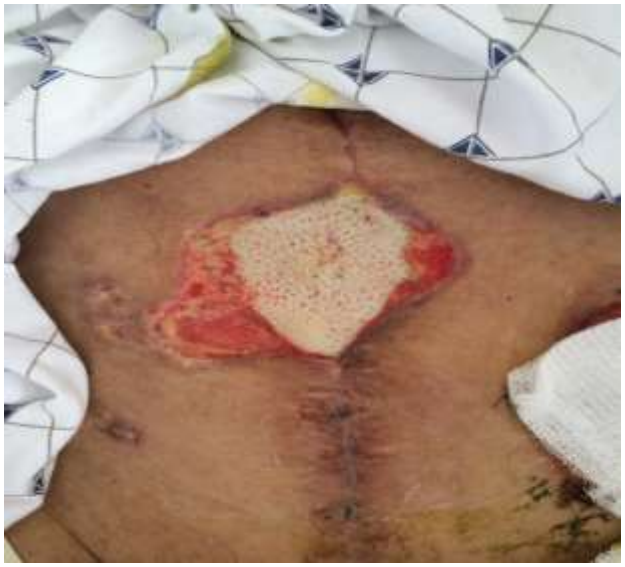

Figure2: Exposed biologic mesh in a patient with Crohn disease who has an ileostomy with a leaking appliance in close proximity to the wound resulting in likely contamination with enteric flora.

4. CONCLUSION

Synthetic and biological meshes are widely used in surgical practice and the number of new products continues to grow. To optimize surgical outcomes, the practicing surgeon must have a thorough understanding of these products to guide proper selection and use. The heterogeneous patient population, variety of techniques employed, and large number of products available make comparisons between existing studies difficult. Since the biological meshes do not have any major advantages over the synthetic meshes with respect to the most important assessment criteria, at present they can only be recommended for situations involving a contaminated surgical field.

REFERENCES

[1] Kingsnorth A, LeBlanc K. Hernias: inguinal and incisional. Lancet 2003;362:1561-71.

[2] Londono-Schimmer E E, Leong A P, Phillips R K. Life table analysis of stomal complications following colostomy. Dis Colon Rectum. 1994;37(9):916–920.

[3] Pearl R K. Parastomal hernias. World J Surg. 1989;13(5):569–572.

[4] Shabbir J, Chaudhary B N, Dawson R. A systematic review on the use of prophylactic mesh during primary stoma formation to prevent parastomal hernia formation. Colorectal Dis. 2012;14(8):931–936.

[5] Carne P W, Robertson G M, Frizelle F A. Parastomal hernia. Br J Surg. 2003;90(7):784–793.

[6] Cheung M T, Chia N H, Chiu W Y. Surgical treatment of parastomal hernia complicating sigmoid colostomies. Dis Colon Rectum. 2001;44(2):266–270.

[7] Mudge M, Hughes LE (1985) Incisional hernia: a 10 year prospective study of incidence and attitudes. Br J Surg 72:70–71

[8] Simons MP, Aufenacker T, Bay-Nielsen M, Bouillot JL, Campanelli G, Conze J, et al. European hernia society guidelines on the treatment of inguinal hernia in adult patients. Hernia (2009) 13:343–403.

[9] Currie A, Andrew H, Tonsi A, Hurley PR, Taribagil S. Lightweight versus heavyweight mesh in laparoscopic inguinal hernia repair: a meta-analysis. Surg Endosc (2012) 26(8):2126–33.

[10] Tyrell J, Silberman H, Chandrasoma P, Niland J, Shull J. Absorbable versus permanent mesh in abdominal operations. Surg Gynecol Obstet (1989) 168(3):227–32.

[11] Sajid MS, Leaver C, Baig MK, Sains P. Systematic review and meta-analysis of the use of lightweight versus heavyweight mesh in open inguinal hernia repair. Br J Surg (2011) 99(1):29–37.

[12] Ansaloni L, Catena F, Coccolini F, Gazzotti F, D'Alessandro L, Pinna AD. Inguinal hernia repair with porcine small intestine submucosa: 3-year follow-up results of a randomized controlled trial of Lichtenstein's repair with polypropylene mesh versus surgisis inguinal hernia matrix. Am J Surg (2009) 198:303–12. doi:10.1016/j.amjsurg. 2008.09.021

[13] Novitsky Y W, Rosen M J. The biology of biologics: basic science and clinical concepts. Plast Reconstr Surg. 2012;130(5) 02:9S–17S.

[14] Hsu PW, Salgado CJ, Kent K, Finnegan M, Pello M, Simons R et al. Evaluation of porcine dermal collagen (Permacol) used in abdominal wall reconstruction. J Plast Reconstr Aesthet Surg 2009;62:1484–9.

[15] Brown P. Abdominal wall reconstruction using biological tissue grafts. AORN J 2009;90:513–20; quiz 21–4.

[16] Morris-Stiff GJ, Hughes LE. The outcomes of nonabsorbable mesh placed within the abdominal cavity: literature review and clinical experience. J Am Coll Surg 1998;186:352–67.

[17] Cook Medical. Biodesign Advanced Tissue Repair. Cook Medical, 2011.

[18] EU Hernia Trialists Collaboration. Repair of groin hernia with synthetic mesh, meta-analysis of randomized controlled trials. Ann Surg 2002;235:322-32.

[19] Bisgaard T, Bay-Nielsen M, Christensen IJ, Kehlet H. Risk of recurrence 5 years or more after primary Lichtenstein mesh and sutured inguinal hernia repair. Br J Surg 2007;94:1038-40.

[20] Kingsnorth A. Controversial topics in surgery: the case for open repair. Ann R Coll Surg Engl 2005;87:59-60.

[21] Janfaza M, Martin M, Skinner R. A preliminary comparison study of two noncrosslinked biologic meshes used in complex ventral hernia repairs. World J Surg. 2012;36(8):1760–1764.

[22] Kim H, Bruen K, Vargo D. Acellular dermal matrix in the management of high-risk abdominal wall defects. Am J Surg. 2006;192(6):705–709.

[23] Novitsky Y W, Rosen M J. The biology of biologics: basic science and clinical concepts. Plast Reconstr Surg. 2012;130(5) 02:9S–17S.

[24] Annor A H, Tang M E, Pui C L. et al. Effect of enzymatic degradation on the mechanical properties of biological scaffold materials. Surg Endosc. 2012;26(10):2767–2778.

[25] Patel K M, Bhanot P. Complications of acellular dermal matrices in abdominal wall reconstruction. Plast Reconstr Surg. 2012;130(5) 02:216S–224S.

[26] de Moya M A, Dunham M, Inaba K. et al. Long-term outcome of acellular dermal matrix when used for large traumatic open abdomen. J Trauma. 2008;65(2):349–353.

[27] Mavros M N, Athanasiou S, Alexiou V G, Mitsikostas P K, Peppas G, Falagas M E. Risk factors for mesh-related infections after hernia repair surgery: a meta-analysis of cohort studies. World J Surg. 2011;35(11):2389–2398.

[28] Cobb W S Kercher K W Heniford B T Laparoscopic repair of incisional hernias Surg Clin North Am 200585191–103.103, ix

[29] Fine AP. Laparoscopic repair of inguinal hernia using surgisis mesh and fibrin sealant. JSLS (2006) 10:461–5.

[30] Agresta F, Bedin N. Transabdominal laparoscopic inguinal hernia repair: is there a place for biological mesh? Hernia (2008) 12:609–12. doi:10.1007/ s10029-008-0390-0

[31] Edelman DS, Selesnick H. "Sports" hernia: treatment with biologic mesh (surgisis). A preliminary study. Surg Endosc (2006) 20:971–3. doi:10.1007/s00464- 005-0281-8

[32] Franklin ME Jr, Gonzalez JJ Jr, Glass JL. Use of porcine small intestinal submucosa as a prothetic device for laparoscopic repair of hernias in contaminated fields: 2-year follow-up. Hernia (2004) 8:186–9. doi:10.1007/ s10029-004-0208-7