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Use of biological prostheses in transplant patients with incisional hernias.Preliminary experience

AIM: *The use of synthetic mesh in transplant patients is still under debate. In this paper the authors report their preliminary experience on biological prosthesis for surgical treatment of incisional hernias in transplant patients.*
MATERIAL OF STUDY: *Between 2009-2010, 10 patients with incisional hernia underwent surgery using a biological prosthesis (porcine dermis collagen). All patients were transplanted: 9 kidney transplants and 1 liver transplant.*
RESULTS: *In all patients postoperative course was uneventful and were not observed complications related to surgery, kind of prosthesis or transplanted organs. At follow up, laparoplasty was associated with good functional outcome.*
DISCUSSION: *Transplant patients are at risk for use of synthetic prostheses, as immunosuppressed. In our preliminary experience biological prostheses compared to synthetic ones showed a greater ability to integrate into tissues, to resist bacterial colonization and to reduce cytotoxic or allergenic reactions, providing similar functional results. Moreover it must be added that biological prostheses did not require reductions/suspensions of immunosuppressive therapy and resulted to be versatile. All these features are particularly sought in incisional hernias surgery of transplanted patients.*
CONCLUSIONS: *Surgery of incisional hernias in transplanted patients requires a prosthesis with characteristics as close as possible to the ideal one and, in this sense, biological prostheses would seem to outweigh synthetic ones. In our experience, biological prostheses have shown to be safe, effective and reliable; therefore they seem to be able to open new horizons in the treatment of wall defects in this group of patients.*

KEY WORDS: Biological prostheses, Incisionel hernia, Transplantation

Introduction

Incisional hernias are a complication of abdominal surgery ranging between 2% and 23% in no selected series and reaching even higher peaks after organ transplantation[1-4]. Over the past years many surgical procedures have been suggested in order to treat incisional hernias[5-8]. Nowadays the majority of surgeons opt for reconstructive techniques involving the implantation of synthetic prostheses[9,10].
This surgical approach is not universally accepted in transplanted patients[11-13]. These patients, due to intrinsic characteristics of their underlying disease, to kind of surgery they undergo and to immunosuppressive therapy they must receive, are at risk when treated with synthetic prostheses. Transplanted patients are not only more prone to develop post-surgical defects of the abdominal wall, but they also show higher risk of developing com-

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plications related to the reduced integration of prosthetic materials and septic problems[14-16]. Recently biological prosthesis have been introduced in clinical practice. These have shown stronger capacity in countering bacterial colonization and better integration with surrounding tissues [17]. We were persuaded by these aspects to believe that these materials are particularly suitable for incisional hernias treatment in transplanted patients. In this work we report our preliminary experience with biological prosthesis in this selected category of patients, paying attention to technical issues, rate of complications, functional results.

Methods and Materials

Between 2009-2010, after obtaining specific informed consents, 10 patients (4 females and 6 males, range 32 -54 years) affected by incisional hernia underwent to tension-free laparoplasty by placing a biological prosthesis of porcine dermis collagen (Fig. 1). All Patients underwent transplantation during the previous three years: 9 kidney transplantations and 1 liver transplantation. In one case a biological prosthesis was concomitantly used to correct a right inguinal hernia. Although preoperatively the aim was to always place the prostheses in the preperitoneal area, we managed to do so in only 6 cases, while in the remaining 4 cases we had to place it in the intraperitoneal area. It has always been allowed a 1,5 cm minimal overlap and the prostheses have always been fixed with 2/0 monofilament simple interrupted stitches. A biopsy of the transplanted organ was performed in three cases. During the preoperative stage all patients underwent either CT or MRI to evaluate dimensions and number of abdominal wall defects, the eventual retraction of muscles and relations with the transplanted organ. All the operations were executed with open technique. Surgical closed active drains in positive continuous pressure were placed at the end of each surgical procedure: always one to protect the prosthesis (Fig. 2) and in some cases one in the subcutaneous space. Drains were kept in place from 3 up to 7 days. All patients underwent antibiotic therapy with 3rd generation cephalosporins only for 3 days after the surgical procedure. Ultrasound scans of abdominal wall and of transplanted organ were planned as part of a one year clinical- instrumental follow up, which was followed by a CT or MRI of the abdominal wall at the beginning of the second year.

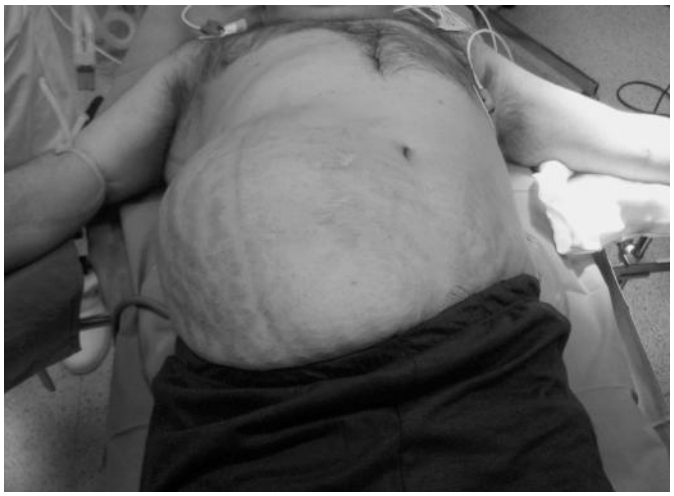

Fig. 1: Giant pararectal incisional hernia after kidney transplantation.

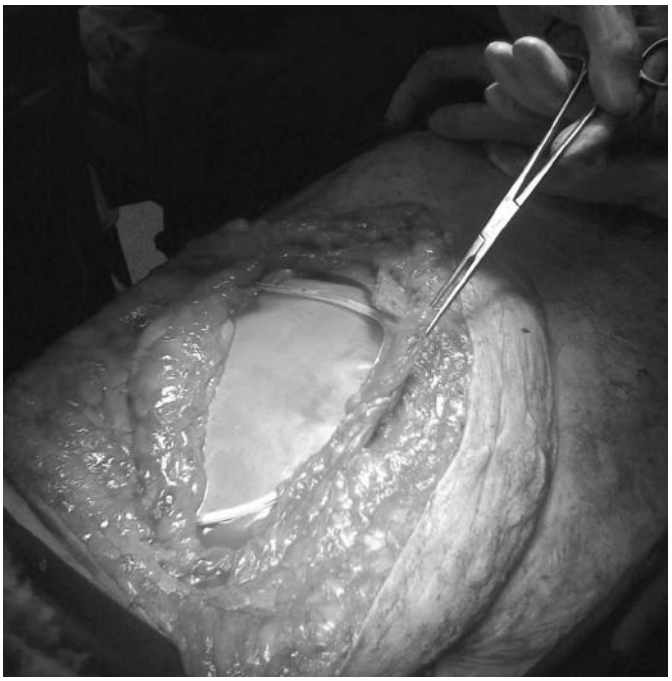

Fig. 2: Previous case. Laparoplasty with biological prosthesis placed and anchored in the intraperitoneal space. The drain placed to protect the prosthesis is shown.

Results

During the procedure the prosthesis implantation was relatively easy. When performed, the biopsy did not interfere with surgical procedure and its outcome. The patient undergoing treatment for incisional and inguinal hernias showed a postoperative orchitis solved in 30 days with medical therapy. The post-operative course was regular among all the other patients and we didn't observe any complication related to the intra-peritoneal implants or to the drains. No functional alterations of the transplanted organs were registered during post-operative and at follow up. The clinical/instrumental follow up has shown in all patients good functional results without relapses or complications related to pathology, procedure

or type of prosthesis used, although it has to be mentioned that only 6/10 patients have completed a 2 years follow up.

Discussion

Incisional hernias are not rare complications of abdominal surgery, and even more of transplant surgery. The incidence of abdominal wall defects in patients undergoing transplantation varies accordingly to the surveys and to the transplanted organ. As for kidney transplantations the incidence rate is between 3% and 13%, while as for liver transplantation the rate accounts for 4% up to 17%[11-16]. Several factors are involved, depending on patients (BMI, kind of underlying disease, comorbidities such as diabetes mellitus or COPD, etc.), on transplantation procedure (type of laparotomy, ascites, abdominal wall infections, onset of seroma/lymphocele, biliary/urinary fistulae, hemoperitoneum, surgeon's experience), on postoperative dialysis and immunosuppressive therapy[16-19]. The latter often involves corticosteroids, mycophenolate mofetil and mTOR inhibitors that interfere with the cicatrization process, slowing it[14]. Therefore it is clear that, also in transplanted patients, incisional hernias treatment was enhanced by the appearance of surgical procedures involving placement of prosthesis. Unfortunately in these patients synthetic prostheses have shown to be a "good" but not "excellent" medical device. An ideal prosthesis should re-establish the abdominal wall continuity, integrate physiologically in it, guarantee the most biocompatibility, reduce risks of complications to minimum levels (such as recurrences, infections, cronic pain, etc.), be easy to use for the operator in order to lessen procedure related risks and difficulties. Synthetic prostheses do not possess all these characteristics and their limits could be highlighted in transplanted patients, so that nowadays their use in this kind of patients is controversial[18-24]. On the other hand biological prostheses compared to synthetic ones have a better aptitude in countering bacterial colonization and a more reliable integration with surrounding tissues without provoking cytotoxic or allergenic reactions.

There are several biological devices approved for clinical use, but in our series we always used porcine dermis collagen prosthesis. We decided to use only one type of prosthesis in order to guarantee homogeneity to our experience and our choice fell on the one in porcine dermis collagen because we already knew it. Briefly, porcine dermis collagen prostheses are characterized by the following aspects: A) They look like an acellular sheet of elastine fibers disposed according to a simple and strong 3D architecture; B) They have an excellent biocompatibility; C) They allow a complete integration with surrounding tissues, facilitating cellular grown and neovascularization; D) They are not resorbable, countering the collagenases hydrolysis; E) They do not cause cytotoxic, hemolytic, allergenic or pyrogenic host reaction; F) They promote the development of a mesothelial layer that makes them suitable for intra-peritoneal implants; G) They do not stimulate the development of a biofilm, therefore antagonizing infections[25,26]. All these characteristics make this kind of prosthesis one of the best in terms of compatibility, reliability, low risk of complications and infection resistance. This induced us in trusting that, from a conceptual point of view, these prostheses are more reliable than the synthetic ones when used to correct abdominal wall defects in transplanted patients and persuaded us to prove clinically their value.

At this stage our experience has been satisfying and, although if limited to 10 cases, it offers the opportunity to state some considerations about surgical technique, onset of complications, functional results. Concerning the first point, despite our procedures always ending successfully, we believe that the reduced ease of use related to this kind of prostheses must be highlighted: in our opinion they shown to be more rigid and less manageable, in particular the bigger ones, when compared to synthetics. This disadvantage is also a limit to their use in laparoscopic procedures, which could be a valid surgical alternative in abdominal wall defects subsequent kidney transplantations. It must be indeed remembered that these transplants, being executed by extra-peritoneal approach, have a reduced risk of developing adhesion so that patients may also benefit from a mini-invasive approach. On the other hand we have to mention that our experience is related exclusively to one biologic device, whether other prostheses could be thinner and handier and therefore could be used with ease also in laparoscopic procedures. Another technical consideration is about the versatility of use of porcine dermis prostheses, that allowed us to implant them in the intraperitoneal space when requested by the intraoperative situation without compromising the possibility of relaparotomy procedures, a not rare event in transplanted patients[27-29]. Lastly, yet from a technical point of view, it must be mentioned that biopsies have always been programmed preoperatively after clinician request and executed in order to assess the anatomical and functional conditions of the graft.

The only postoperative complication we experienced was the onset of orchitis in the patient treated with biological prostheses for both inguinal and incisional hernia. We believe that this complication is due to both intrinsic characteristic of the hernia (big dimensions, inveterate, with substantial adhesions) and the procedure that it required to be treated, but it is also due to the type of prosthesis that, being thick (1,5 mm) and rigid, contributed to create a "difficult discharge condition" of the gonad. This complication didn't require invasive treatments and was solved with medical therapy. The absence of other postoperative complications, in particular seroma and fluid collections, is mainly due to the use of a meticulous surgical technique and to the implant of

drains in positive continuous pressure rather than to the type of applied prosthesis.
From a functional point of view the results are satisfying, although we do not possess a full 2-year follow up for each patient. We didn't observe clinical or instrumental signs of recurrence of the abdominal wall defect and patients report subjective comfort and well being. In the same way transplanted organs didn't show any sign of functional impairments linked to the surgical procedure and its subsequent therapy. Indeed reducing to the minimum the postoperative pharmacological therapy (only 3 days of antibiotics therapy in immunosuppressed patients undergoing prosthesis implantation!) and not interrupting the immunosuppressive therapy allowed us to avoid pharmacological damage to the transplanted organs and to continue protecting them from rejection risks. It must be mentioned that 2 out of 10 patients were on mTOR inhibitors therapy and they substituted this drug with calcineurin inhibitors one month before the surgery, re-establishing the former therapy 2 months after the operation.

Conclusions

Use of prostheses in transplant recipients is still under debate because they are delicate and immunosuppressed patients. So, when prostheses are implanted in these patients it is fundamental to use devices that facilitate tissue integration, reduce infective risk, allow an easy relaparatomy (when necessary) and do not require reduction or suspension of immunosuppressive therapy. On account of our positive results obtained during a preliminary experience and considering the characteristics of biological prostheses, we suppose that these devices, although expansive, could open new horizons in treatment of abdominal wall defects in transplanted patients eventually becoming, in a not too distant future, the gold standard for their treatment.

Riassunto

OBIETTIVO: L'utilizzo delle protesi sintetiche per la correzione dei laparoceli nei pazienti trapiantati è ancora in discussione. In questo lavoro gli autori riportano la loro esperienza preliminare nell'utilizzo delle protesi biologiche in questa categoria di pazienti.
MATERIALE E METODO: Tra il 2009 e il 2010, sono stati sottoposti ad intervento chirurgico 10 pazienti affetti da laparocele mediante l'apposizione di una protesi biologica in collagene di derma porcino. I pazienti erano stati tutti sottoposti a trapianto nei tre anni precedenti: 9 trapianti di rene ed 1 trapianto di fegato.
RISULTATI: Il decorso post-operatorio è stato regolare in tutti i pazienti e non sono state osservate complicanze legate all'impianto della protesi né alterazioni degli organi trapiantati. La laparoplastica si è associata ad un buon risultato funzionale, in tutti i pazienti
DISCUSSIONE: I pazienti trapiantati sono soggetti a rischio per l'utilizzo delle protesi sintetiche, in quanto immunodepressi. Sul piano teorico le protesi biologiche, sebbene costose, mostrano rispetto a quelle sintetiche una maggiore capacità di integrarsi nei tessuti, di resistere alla colonizzazione batterica, di ridurre le reazioni citotossiche o allergeniche e di non richiedere riduzioni/sospensioni della terapia immunosoppressiva, il tutto garantendo analoghi risultati funzionali. A queste va aggiunta la loro versatilità d'impiego. Tutte caratteristiche particolarmente ricercate nella chirurgia dei laparoceli dei pazienti trapiantati e che la nostra esperienza preliminare ha confermato sul piano clinico.
CONCLUSIONI: La correzione chirurgica dei laparoceli nei pazienti trapiantati richiede protesi con caratteristiche il più vicino possibile a quelle ideali e, in questo senso, le protesi biologiche sembrerebbero sopravanzare quelle sintetiche. Nella nostra esperienza le protesi biologiche si sono dimostrate dei presidi validi e sicuri tanto da sembrare in grado di poter aprire nuovi scenari nel trattamento dei difetti di parete in questa categoria di pazienti.

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