109

Claerhout F[1], Deprest J[2], Zheng F[3], Konstantinovic M[4], Lagae P[4], De Ridder D[5]
1. UniversityPelvic Floor Unit, Hospital Gasthuisberg, 2. Dept. Obstetrics and Gynaecology, UZ Gasthuisberg, 3. Centre for Surgical Technologies, KU Leuven, 4. Centre for Surgical Technologies, 5. Dept. Urology, UZ Gasthuisberg

LONG TERM EVALUATION OF THE TISSUE RESPONSE AND MECHANICAL PROPERTIES OF TWO COLLAGEN BASED AND POLYPROPYLENE IMPLANTS IN A RABBIT MODEL FOR ABDOMINAL WALL REPAIR.

Aims of Study

Implant materials are often used to reinforce repairs using native fascia in prolapse patients. Polypropylene is the best studied material but clinical and experimental data on recently introduced collagen based materials remain scarse. We conducted a long term experimental study in rabbits, comparing herniation, adhesion formation and tensile strength of porcine dermal collagen (Pelvicol, Bard), collagen matrix derived from porcine small intestinal mucosa (SIS, Cook) and Prolene (Johnson&Johnson).

Methods

Four 2.5x2.5 cm full thickness abdominal wall defects were created in 45 rabbits. In a random fashion defects were primarily closed with the studied materials. Implants were sutured to the native tissues with Prolene 3.0. Nine rabbits were sacrificed at either 30, 60, 90, 180 or 360 days (d), at what time the presence of herniation, infection and adhesions were assessed. Tensile strength of freshly harvested explants (= implant, the interface to the recipient and surrounding native fascia) was measured with a tensiometer, noting the tearing force (N) both at the level of the interface as well as from the implant itself (frame F-DM-H1072; console TT-DM-1118; Instron Corp, Canton, MA).

Results

Surgisis was as such not recognisable anymore after 3 months (Figure 2); the implant area appeared at that time as a thin, nearly transparent membrane. Pelvicol remained well recognisable during the entire year following implantation, covered with a layer of 1-2 mm of connective tissue (Figure 1). One rabbit showed herniation through two of the four implant areas, i.e. a Pelvicol and a SIS reconstruction area (Figure 3). The two non involved implant areas were covered by Prolene. Adhesions were more frequent in the Prolene group than in the collagen-based implants (5.1% versus 73%; $P < .05$). In the latter, adhesions were mainly located on the prolene sutures at the interface. Tensiometry showed that for Prolene and Pelvicol explants, the explant always did tear at the interface (interquartile range : 10-15 N). For Surgisis explants, the implant itself ruptured first in 72% of cases. As for the materials, Prolene was always the strongest. In the first half year, Pelvicol was as strong as Prolene and stronger than Surgisis, but from 180 d on, its strength decreased gradually to levels comparable to SIS animals (table).

Conclusions

When Pelvicol and Prolene were used in an experimental setting, the interface between native tissues and the implant is always the weakest point. For Surgisis, in three quarters of cases the locus minoris resistentiae is the implant itself. Clinically, Prolene induces more adhesions but has the highest tensile strength over a 1-year observation period. Generally spoken Pelvicol is not degraded, while Surgisis is not recognisable within months. Despite the lower tensile strength of the collagen based materials, and clear resorption and remodelling of the SIS-implants, herniation is uncommon in both collagen based implants. There were no herniations in the Prolene group.

Fig 1: Pelvicol mesh after 1 year

Fig 2: Surgisis after 1 year. The implant is nearly transparant

Fig 3: Visceral view of herniation of (right) SurgisiS (left) Pelvicol implant area

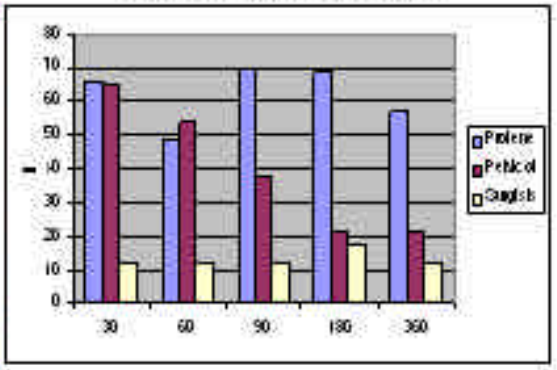

Table: Tensile strength (N) at different time points in the experiment (d).