The Use of Mesh in Gynaecological Surgery
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1. Introduction

The use of mesh in gynaecological practice in the treatment of stress urinary incontinence and pelvic-organ prolapse is growing. There is anxiety and uncertainty about the long-term outcome of these interventions. This paper highlights these controversies.

In 1996, Ulmsten described the transvaginal tape (TVT) procedure and the following year, with only limited data, it was released to the market. This is a tape constructed of type-I polypropylene woven mesh. It was aggressively promoted and rapidly adopted by many gynaecologists within Europe, even though the UK and Ireland TVT Trial Group did not start recruiting patients until 1998. Fortunately, long-term follow-up studies have confirmed not only the efficacy of this procedure but also its low complication rate. Many would now consider a mid-urethral tape constructed of type-I polypropylene mesh to be the surgical treatment of choice in primary urodynamic stress incontinence.

Pelvic-organ prolapse is a common condition affecting thousands of women worldwide and surgery rates to correct prolapse are currently increasing. Up to 300,000 women undergo surgery for pelvic-organ prolapse in the USA each year. Treatment for vaginal prolapse is associated with a high recurrence rate, with the reoperation rate reported at 17% within 10 years, although even this was considered to underestimate the true rate. The success obtained with the TVT operation and abdominal hernia surgery using mesh and the high reoperation rate for prolapse, would therefore suggest the use of mesh for prolapse surgery. However, concern exists that some of the currently available mesh materials and techniques using mesh in gynaecological prolapse surgery could be associated with significant morbidity, especially if the surgeon is not familiar with the principles and properties of the individual materials.

2. Types of mesh

Two types of mesh are used in surgery: biological and synthetic. Synthetic meshes are further classified into whether they are absorbable or non-absorbable.

Biological grafts have the theoretical advantage of reduced erosion rates but the disadvantages of inconsistent tissue strength and potential transmission of infection. Chaliha et al. studied the use of small intestine submucosa during anterior repair. At 6 months, SIS appeared to offer an advantage in terms of quality of life and validated pelvic-organ prolapse quantification scores but the differences were not present at 2 years. A recent report has demonstrated that xenogenic acellular collagen matrices used for advanced prolapse repair failed to reduce graft-related complications and were associated with high failure rates (data are available on the use of absorbable synthetic mesh in gynaecological prolapse surgery). Animal experiments and in vitro human experience suggest that absorbable synthetic mesh is an unsuitable prosthesis. It has been shown that adequate fibrous tissue incorporation does not occur before the hydrolysis of implanted polyglactin mesh. An absorbable mesh that remains in place long enough for significant three-dimensional fibrous in-growth remains an aspirational goal. With current knowledge, the use of absorbable mesh cannot be recommended for reconstructive prolapse surgery.

A classification of synthetic meshes, based on their physical characteristics was proposed by Amid. Type-IV mesh is not suitable for use in soft tissue, being a relatively solid sheath which totally resists incorporation. Type-II and type-III mesh materials are constructed using multifilamentous materials and have small pore sizes. As a result of these characteristics, they can harbour bacteria and, by so doing, promote bacterial growth. Type-I meshes are constructed using monofilament fibres and have a large pore size (greater than 90 microns), as a result of which they have lower rates of infection and erosion. The large pore size admits macrophages and allows rapid angiogenesis. The perimesh inflammatory response soon settles and the mesh is incorporated by fibrous tissue ingrowth. The majority of meshes
current available for incontinence and prolapse surgery are of Amid type-I. They are therefore similar to the type of mesh used in the manufacturing of midurethral tapes but have a much larger surface area.

3. Current clinical practice

Following the publication by Benson,9 which demonstrated that abdominal repair with mesh has a better outcome than vaginal surgery with a sacrospinous fixation, there have been numerous publications supporting the use of type-I mesh in abdominal surgery for apical vaginal prolapse. Reported erosion rates were very low but most of these publications were case series.

Data related to the laying in of mesh to ‘reinforce’ an anterior or posterior repair are very limited and consist mostly of case series. However, Higgs et al.10 reported a prospective randomised controlled trial between anterior repair and repair with mesh. At 6 months, vaginal repair with mesh demonstrated significantly higher success rates (75% compared with 57%) both objectively and subjectively. There were three mesh erosions from 62 repairs. Although this study failed to identify differences in the rate of dyspareunia, other case series data do suggest that this as a potential problem and appropriate preoperative counselling is essential. A recent study demonstrated that anterior colporrhaphy reinforced with mesh significantly reduced failure from 41% to 11% when compared with traditional surgery.11 The guideline on surgical repair of vaginal wall prolapse using mesh from the National Institute for Health and Clinical Excellence (NICE) suggests that mesh may have an advantage over traditional repair and sets out guidance on the implementation of mesh repairs in practice.12

The newer operations for prolapse (apogee, perigee, prolift and so on) which attempt to provide level I and level II (support to the upper and middle aspects of the vagina)13 support are transvaginal procedures. Evidence for their use is based on case series with relatively short-term follow-up. A recent retrospective multicentre study of these devices (289 women) demonstrated good short-term results in terms of prolapse resolution but with significant complications: buttock pain (52%), vaginal erosion (10%), one case of bladder erosion and two women with serious infection.14 Caution must be therefore be employed before newer operations are introduced into clinical practice.

Each new procedure should declare the properties of the grafts and should supply data on erosion and infection rates. Each operation should also supply data on bowel, bladder and sexual function.

4. Opinion

The use of mesh in surgery for stress urinary incontinence (SUI) and pelvic-organ prolapse is growing fast. There is evidence to support the use of type-I mesh materials in surgery for SUI. However, many variants of the TVT procedure are being introduced with limited data and no long-term follow-up. Further research and monitoring of these procedures is required before they are adopted widely.

A NICE interventional procedure guidance supports the use of mesh in abdominal surgery for apical pelvic-organ prolapse, provided that the normal arrangements for consent, audit and clinical governance are in place.15 The operation should only be carried out by surgeons specialising in the management of pelvic-organ prolapse and female urinary incontinence.

Less evidence exists for the use of mesh materials transvaginally and stricter governance needs to be employed in the introduction of techniques for mesh repair. With the current state of knowledge, the transvaginal operations for prolapse should only be used under carefully controlled circumstances. Ideally, they should be introduced under trial conditions but if this is not possible they should be introduced as part of a registry. In any event, these procedures should only be carried out by gynaecologists with special expertise in the surgical management of pelvic organ prolapse.12
The British Society of Urogynaecology has a web-based national database which offers the opportunity for local and national audit of all incontinence and prolapse operations (http://bsug.net/index.php). This offers a pragmatic approach to obtaining surgical outcome data in a rapidly changing environment.

References

10. Higgs PJ, Carey MP, Goh JTW, Krause HG, Leong A, Cornish A. Randomised controlled trial comparing vaginal prolapse repair with mesh augmentation to traditional repair; a six month follow up. 31st Annual IUGA Meeting. *Int Urogynecol J Pelvic Floor Dysfunct* 2006;17 Suppl 2:64.