Peer reviewed article

A short-term independent audit of mesh repair for the treatment of rectocele in women, using 3-dimensional volume ultrasound: a pilot study

Abstract

The aim of this study was to determine if three-dimensional ultrasound (3-DUS) could be used to assess the outcome of rectocele repair. This was a retrospective, observational study using transperineal 3-DUS on 71 women who had undergone rectocele repair using a mesh overlay technique. The severity of the rectocele was assessed at the time of surgery and at follow-up. Ultrasound examination was undertaken independently with a standardised review of associated urinary and bowel symptomatology. Results showed there was no correlation between levator dimensions or perineal mobility with age, parity, follow-up time or symptoms of bowel dysfunction. Nor was there any correlation between such symptoms and persistence of a fascial defect on ultrasound which were evident in over 20% of patients. There was a moderate negative correlation between levator hiatal area on Valsalva and descent of the rectal ampulla, as well as clinical and ultrasound evidence of rectocele recurrence. It was concluded that 3-DUS of the pelvic floor offered an independent and objective assessment of the outcomes of pelvic floor surgery.

The authors undertook the research without financial support and there is no conflict of interest.

Introduction

The management of rectoceles in women has been complicated by a lack of correlation with symptoms, poor assessment tools, and a myriad of variations in surgical correction without standardised methods of follow-up. Surgical correction has traditionally employed vaginal surgery, usually plication of recto-vaginal fascia, often with part of the levator complex. Success rates of up to 85% have been cited in prospective studies, but there have been concerns about the incidence of dyspareunia and pain following procedures, which have ranged from 6-27%, with the figure higher in the larger studies.

Richardson’s anatomical studies suggest that rectocele formation may be due to specific, identifiable defects in the fascia and, as a result, correction now employs closure of these recto-vaginal fascial defects. The success of this surgical approach has been studied in a small number of prospective, longitudinal studies, with surgical correction in 77-82% of cases and improvement in the occurrence of dyspareunia.

An alternative method for fascial reinforcement employs artificial, inert mesh to reinforce the fascial remnants which are often attenuated in older women. This technique follows the rationale that the protrusion of a rectocele can be likened to a hernia. Large studies on abdominal hernia repair advocate artificial permanent mesh for correction, as the recurrence is lower than with traditional surgical methods alone. Our unit has been assessing the use of Vicryl-Prolene mesh, using the four-point attachment overlay technique, to attempt to improve the success of surgical rectocele.

A short- to medium-term study demonstrated recurrence rates of 16% and new dyspareunia rates of 3.4% suggests that this technique may offer reduced dyspareunia rates with equivalent recurrences to other techniques. As part of this ongoing assessment, a further study was undertaken to compare 3-dimensional ultrasound (3-DUS) with clinical assessment as an independent objective assessment tool; this is reported in this paper.

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Transperineal ultrasound has been used to assess surgical placement of suburethral slings, bladder and urethral hypermobility and bladder wall measurements and as a research tool for urinary incontinence\cite{14-16}. In addition, 2-D transperineal ultrasound has previously been shown to correlate closely with the POP-Q scoring system, for assessment of pelvic organ prolapse (POP)\cite{17}.

The use of 3-D US to assess pelvic structures, although available for some years, has been hampered by the slow development of software and the necessity of operator controlled sector scanning. Recent improvements in processor speed, software and automated image acquisition have considerably improved the quality and reliability of imaging assessments. Volume ultrasound now permits imaging of pelvic structures in any user-defined plane, orthogonal or oblique, allowing qualitative and quantitative assessment of structures such as the posterior vaginal wall. Combined with the ability to review images at a later stage in any plane, it is a potentially useful tool for the assessment of female POP.

**Study design, materials and methods**

This was a retrospective, single blinded study of the outcome of rectocele repair in 71 women. Eighty two consecutive women were recruited from two hospitals [TTH and MH], having been operated on using a standard technique using composite Vicryl-Prolene mesh cut to lay over the defect, which was then secured at four points without tension. The vagina was then closed using a single 2/0 Vicryl absorbable suture. All operations were undertaken by or under the supervision of one senior experienced surgeon [AR].

For the post-operative ultrasound assessment, women were asked to empty their bladder and were placed in the supine position. A GE Kretz Voluson 730 ultrasound system was used. A Kretz 7-4MHz volume transducer was placed on the perineum in the mid-sagittal plane. The transducer was covered with a powder-free glove prior to the examination. Using ultrasonic jelly at the interface, volume data were acquired at rest and on maximum Valsalva. The participants had practised the manoeuvre at least three times, under close supervision, prior to the ultrasound.

Test-retest parameters for measurement of bladder neck mobility using this technique confirmed the validity of this method\cite{18}. However, great care must be taken to avoid reflex contraction of the levator ani.

Volumes were stored and reviewed at a later date. Defects in the rectovaginal septum were noted and measured in the oblique cranio-caudal diameter, as well as vertically, to obtain the depth of the defect (Figure 1).

In addition, the degree of perineal mobility was assessed by measuring caudal displacement of the rectal ampulla, relative to the inferior margin of the symphysis pubis. The technique has previously been described\cite{20}. The diameters and area of the levator hiatus at rest and on Valsalva were measured (Figure 2), such that the plane chosen was symmetrical, containing the shortest distance between symphysis pubis anteriorly and levator muscle posteriorly\cite{21}; comparative anatomy is shown in Figure 3.

Prospective demographic data, which were not available to the investigators at the time of study or volume analysis, were subsequently analysed. This included age, parity, menopausal status, previous surgery in addition to concomitant surgery, and peri-operative and post-operative complications. Using the Baden-Walker\cite{23} scoring system pre and post-operatively, comparisons were made with the ultrasound findings.

Data were analysed using ANOVA, two-sample t-test as well as Pearson correlation statistics\cite{24} with the help of SPSS 11.0, Chicago, IL [licensed to James Cook University].

This study was granted ethics approval (protocol number 22/03) from the Townsville Hospital. There was no industry support or conflict of interest.

**Results**

Of the 82 women recruited, 71 with complete datasets were studied. Eleven women had insufficient pre-operative or ultrasound data to be included in the study. There was no difference in the demographics between those women excluded and those included in the study. Mean age was 58.6 years (SD=12.4), mean parity of 3. Thirteen women (19%) had had previous vaginal wall prolapse repairs and 50 women (71%) had other concomitant prolapse repairs, hysterectomy or urethrotomy. Of those 50 women, 26 (37%) had anterior wall repairs, four (6%) had hysterectomies, and one (1%) had a vault suspension. Prior to surgery, the median score for posterior compartment prolapse was II using the Baden-Walker\cite{21} classification scale.

![Figure 1. A sagittal view of the posterior compartment demonstrating the defect of the rectovaginal septum [reproduced with permission\cite{19}].](image-url)
The average length of time following surgery at follow-up was 0.7 years (SD=0.29). Clinical evaluation revealed a recurrence of the rectocele in four women (5.6%); three were classified as Grade I and one woman had a Grade II recurrence.

On ultrasound, 16 women (23%) had persistent defects of the recto-vaginal septum. Of these women, one had a defect greater than 2cm in depth and six (8.5%) had defects greater than 1cm. Mean depth of such defects was 0.92cm (SD=0.2) and width was 1.56cm (SD=0.35cm). Mean areas of the levator hiatus were 17.87cm (SD=3.72cm) at rest and 23.76cm (SD=4.43cm) on Valsalva. The rectal ampulla reached 0.13cm (SD=1.32) above the symphysis pubis on average.

There was no correlation between levator area, antero-posterior (AP) or transverse diameters – whether at rest, on Valsalva, or perineal mobility – with age, parity, follow-up time, or the symptom of incomplete bowel emptying. Nor was there any correlation between this symptom and persistence of a defect as seen on ultrasound (p=0.477, two-sample T-test). There was, however, a moderate negative correlation between descent of the rectal ampulla and levator hiatal area on Valsalva (r=–0.428, p=0.002) as well as the hiatal AP diameter on Valsalva (r=–0.39, p=0.006).

In addition, there was an association towards a larger levator hiatus in those who had evidence of recurrence clinically (p=0.067) and on ultrasound (0.014). Depth (r=0.306, p=0.01) and width (r=0.343, p=0.003) of a recurrent defect of the rectovaginal septum were also associated with hiatal area on Valsalva.

Discussion

This study is the first to be published describing the use of 3-DUS to audit the results of pelvic floor surgery and to compare this with clinical evaluation. It demonstrates a persistence of defects of the rectovaginal septum in over 20% of women after rectocele repair using a mesh implant. However, most of these defects were very small, and persistence of a defect did not correlate with symptoms of incomplete bowel emptying.
Many patients also showed a significant degree of perineal hypermobility; this correlated with increasing dimensions of the levator hiatus on Valsalva. There was also an association with clinical and ultrasound diagnosed recurrence of rectovaginal septal defects with increased levator dimensions. Failure to affect the dimensions of the levator hiatus may account for those failures of surgery, which can be postulated to reduce support for the fascia. Even if the defect in the rectovaginal septum is reduced or closed, underlying perineal hypermobility due to genetic predisposition or mechanical disruption may not be addressed and lead to apparent failures. Marked levator widening on Valsalva may expose the repaired area to increased strain, resulting in a higher likelihood of recurrence.

3-DUS of the pelvic floor is a procedure that can provide information quickly and this study shows that it may offer an independent and objective assessment of pelvic floor surgery. Other studies validating ultrasonography for the posterior female pelvic compartment have been limited to the mid sagittal plane \(^\text{17, 21-28}\), but have demonstrated not only that defects can be identified but also there is good correlation with the POP-Q assessment. The ability to assess lateral and central support using 3-DUS permits more detailed off-line evaluation of the underlying muscle and fascial support \(^\text{29}\).

In this study there was a wide variation in ultrasound findings post-operatively, with the mesh sometimes being clearly seen either providing coverage of the defect or having moved laterally. Persistent defects of the rectovaginal septum at an average follow-up time of 7 months were common, but were mostly small and not associated with persistence of symptoms. At other times, the mesh was not visible at all, and in such cases it could be speculated that the mesh provides no lasting support.

The dimensions of the levator hiatus on Valsalva (i.e. the presence of ‘levator ballooning’) may be important for the correction of posterior compartment prolapse. Two main explanations may be offered. Firstly, clinical recurrence seems more likely in women with levator ballooning because of a failure to address a wide hiatus before surgery, resulting in persistent perineal hypermobility post-operatively. Secondly, a wide hiatus may expose any repair to more strain, resulting in a higher likelihood of recurrence of fascial defects.

We therefore postulate that pre-operative assessment of levator dimensions might assist the surgeon in a number of ways – if there is a defect of the rectovaginal septum, then such a defect should be closed, or if there is marked enlargement of the hiatus on Valsalva and perineal hypermobility, then the most effective way to reduce posterior compartment prolapse may be a levatorplasty \(^\text{30}\). Although this concept is currently rather unpopular due to the risk of dyspareunia \(^\text{14}\), in general it is suspected that the dimensions of the levator hiatus may be important not just for recurrence of rectocele, but for prolapse recurrence in general.

Limitations of this study are that there were no pre-operative ultrasound volume data sets to compare with the post-operative results. In addition, symptom questionnaires were non-standardised prior to surgery and the Baden-Walker \(^\text{21}\) system of classification was utilised, which is not the optimal method for assessment of POP.

In conclusion, the study, though limited, has been informative in evaluating the usefulness of 3-DUS in assessing the pelvic floor of women after surgical correction of POP. Prospective studies are ongoing using the POP-Q classification with ultrasound assessment before and after surgery, together with validated questionnaires assessing pelvic symptoms and quality of life. The results of these studies should help to further define the place of volume ultrasound in the assessment and for the objective follow-up of women with prolapse.

References


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