could be chosen to link to action policy decisions. In the Integrated Management of Childhood Illness (IMCI) programme, such a screening test would also remind the health provider to prescribe an iron tonic and to emphasise the importance of a balanced diet.

A potential disadvantage of copper sulphate densitometry lies in the gradual change of the SG of the copper sulphate solution with repeated blood drops. A fresh 100 ml solution must be available after every 20 tests. The logistics of a steady supply of copper sulphate solution must therefore be worked out for each testing site.

RECOMMENDATION

We recommend that copper sulphate densitometry screening for anaemia be incorporated in the IMCI programme at primary care level. Any child under the age of 36 months attending for incidental health care should be screened. Children who screen positive should receive a month's treatment with iron, and then return for a further screen. If the result is still positive the child should be referred for evaluation of non-responding anaemia. Children attending for routine well-baby care and immunisation at 6 and 9 months of age could similarly be screened.

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References

1. Schwartz E. Iron deficiency anemia. In: Behrman RE, Kliegman RM, Jenson HB, eds. *Nelson Textbook of Paediatrics*. 16th ed. Philadelphia: WB Saunders, 2000: 1469-1471.
2. Swann IL, Kendra JR. Severe iron deficiency anaemia and stroke. *Clin Lab Haematol* 2000; **22:** 221-213.
3. Sherriff A, Emond A, Bell JC, Golding J. ALSPAC Study Team. Should infants be screened for anaemia? A prospective study investigating the relation between haemoglobin at 8, 12, and 18 months and development at 18 months. *Arch Dis Child* 2001; **84:** 480-485.
4. Gjorup T, Bugge TM, Hendricksen C, Jensen AM. A critical evaluation of the clinical diagnosis of anemia. *Am J Epidemiol* 1986; **124:** 657-665.
5. Stone JE, Simmons WK, Jutsum PJ, Gurney JM. An evaluation of methods of screening for anaemia. *Bull World Health Organ* 1984; **62:** 115-120.
6. Phillips RA, Van Slyke DD, Hamilton PB, *et al*. Measurement of specific gravities for whole blood and plasma by standard copper sulfate solutions. *J Biol Chem* 1950; **183:** 305-330.
7. Van Slyke DD, Phillips RA, Dole VP, *et al*. Calculation of hemoglobin from blood specific gravities. *J Biol Chem* 1950; **183:** 349-360.
8. Pistorius LR, Funk M, Pattinson RC, Howarth GR. Screening for anaemia in pregnancy with copper sulfate densitometry. *Int J Gynecol Obstet* 1996; **52:** 33-36.
9. Kalter HD, Burnham G, Kolstad PR, *et al*. Evaluation of clinical signs to diagnose anaemia in Uganda and Bangladesh, in areas with and without malaria. *Bull World Health Organ* 1997; **75:** suppl 1, 103-111.
10. Ekunwe EO. Predictive value of conjunctival pallor in the diagnosis of anaemia. *West Afr J Med* 1997; **16:** 246-250.
11. Linegar AG, Knottenbelt JD, Wormald PJ. Accuracy of a portable haemoglobinometer in clinical practice. *S Afr Med J* 1991; **79:** 547-548.

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SACROCOLPOPEXY — A REPORT ON 262 CONSECUTIVE OPERATIONS

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Objectives. This report analyses the outcome and complications of 262 consecutive sacrocolpopexy procedures for the repair of vaginal vault prolapse and enterocele.

Methods. From March 1994 to February 2001, 262 patients underwent surgical repair using a standardised retroperitoneal technique. Initially dura mater strips were used and from the 19th patient onwards, Gore-tex soft tissue patch was used to suspend the vaginal apex to the anterior sacral ligament. Halban-type occluding sutures were placed in the pouch of Douglas. All patients were followed up and the minimum duration of follow-up was 16 months.

Results. Vaginal vault prolapse was successfully managed in 259 of 262 patients giving a success rate of 98.8%. In addition, 4 patients had a repeat enterocele that required surgical repair. The overall surgical complication rate was low. Erosion of the patch through the vaginal vault occurred in 10 patients, necessitating removal of the patch. Prolapse did not recur in any of these patients.

Conclusion. Abdominal sacrocolpopexy is a very successful and safe surgical management of vaginal vault prolapse.

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Post-hysterectomy prolapse of the vaginal vault is an uncommon late effect of hysterectomy, with reported incidence rates of 0.1 - 1%.[1] The pathophysiology is a failure of the support mechanisms of the vagina due to factors including weakness of collagen tissue, pelvic floor damage associated with pregnancy and childbirth, and possibly the hysterectomy itself as this leads to transection of the ligamentous supports of the cervix. Patients present with pelvic discomfort, urinary or colorectal urgency, difficulty in voiding which may often require manual support of the prolapse to allow the act of voiding, and overflow urinary incontinence.[1,2] Vaginal vault prolapse inevitably presents as an enterocele.

The surgical management of severe partial or total prolapse of the vaginal vault remains a challenging prospect.[1-3] Because

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of differences in history and presentation each patient's problem is regarded as unique and treatment is individualised in most cases. Of the several techniques that have been described as achieving satisfactory and long-lasting suspension of the vaginal vault, good success rates have been reported with transvaginal sacrospinous ligament fixation[4] and abdominal sacrocolpopexy.[2,3,5]

Since the first description of sacrocolpopexy in 1962[6] various materials have been used as a graft to support the vaginal apex and walls. Several complications have been reported including haemorrhage, voiding problems, stress incontinence, detrusor instability and graft infection.[7]

A report is presented of 262 consecutive patients who underwent sacrocolpopexy for the surgical repair of vaginal vault prolapse.

PATIENTS AND METHODS

All patients referred with vaginal vault prolapse were assessed for sacrocolpopexy or for sacrospinous ligament fixation. Patients with vaginal eversion or with very weak vaginal wall support were selected for sacrospinous ligament fixation operations. Patients with good vaginal wall support, typically after recent anterior and posterior colporrhaphy, who were diagnosed with vaginal vault prolapse and enterocele were selected for sacrocolpopexy. All patients who underwent sacrocolpopexy were included in the analysis.

Patients with massive enterocele with the uterus *in situ* were rarely seen but were also included in the analysis.

All patients were preoperatively assessed and the prolapse was graded into one of three grades: grade 1 where the prolapse descended into the upper half of the vagina, grade 2 where the prolapse descended into the lower half of the vagina and into the introitus, and grade 3 where the prolapse descended past the introitus. Although it is recognised that prolapse appears to be less severe with the patient in the supine position, examination in the standing position was not routinely performed on the basis of reports of no added information gleaned from such examinations.[8] Only patients with grade 2 and 3 prolapse were considered for surgery.

Presence of additional types of prolapse was noted. Patients with stress incontinence and those with mild cystocele were considered for Burch vesicosuspension. Patients with very relaxed perineal muscles and low rectocele were considered for posterior colporrhaphy.

Surgery was performed under general anaesthesia after pre-existing medical conditions had been corrected as far as possible. One of the authors (BGL) was present at all operations and performed approximately three-quarters of the procedures, the remainder being performed by the second author (WSN). All patients received 1 - 3 doses of antibiotics intra- and postoperatively. Anticoagulation was managed according to the anticoagulation risk assessment of the Royal College of Obstetricians and Gynaecologists.[9]

Follow-up was done after 2 - 6 months by one of the surgeons or by the referring doctors.

Operative technique

The patient was placed in the semi-lithotomy position. The Pfannenstiel incision was preferred even when subumbilical vertical scars were present. Once the peritoneal cavity had been opened adhesions were dissected when present. A retroperitoneal approach was used in all cases. The posterior parietal peritoneum was incised vertically from the promontory to the vaginal apex, between the midline and the right ureter. Small blood vessels were clamped with vascular clips. The vaginal vault was elevated by an assistant using an instrument pushed through the introitus. Once elevated the dissection of the peritoneal covering of the vault was completed. The bladder was dissected off the vagina for 1 - 2 cm anteriorly, and the rectovaginal space was dissected posteriorly for 2 - 4 cm.

For the first 18 cases a strip of commercially available dura mater was used. Thereafter supply of that material was discontinued. For all subsequent patients the Gore-tex soft tissue patch (Gore and Associates Inc., Flagstaff, Ariz., USA) was used to suspend the vaginal vault. The presacral ligament was exposed in the midline over S1-2 by careful dissection avoiding injury to the median sacral vessels. The soft tissue patch was sutured to the ligament using Gore-tex suturing material. The distal end of the patch was sutured to the vaginal apex in several places to minimise pulling tension in any one area. Care was taken to utilise as much as possible of the posterior dissected vaginal wall. Suspension tension was judged by pulling the patch cranially. Once the desired tension was identified the patch was sutured onto itself to maintain suspension while allowing upward movement of the vaginal apex. The peritoneum was then sutured to cover the patch.

All patients who had Gore-tex patch procedures also had occlusive Halban-type sutures placed in the pouch of Douglas.[10] Several sutures were inserted in the peritoneum from anterior to posterior and when tied achieved a flattening of the pouch of Douglas and a straightening of the rectum. This was preferred to the Moschowitz type of circular sutures because it has much less effect on the course of the ureters in the pelvis. When a Burch vesicosuspension was planned it was performed at this stage, through opening the retropubic space and placing sutures between the vagina and the ileopectineal line. After closing of the abdomen a posterior colporrhaphy was performed in those patients with perineal defects.

RESULTS

Between March 1994 and February 2001 a total of 262 patients underwent sacrocolpopexy using this technique. Their ages

ranged from 28 to 79 years but most fell into the age group 55 - 70 years. In 254 patients (97%) the sacrocolpopexy was performed as a non-primary prolapse operation with a range of previous prolapse surgery of 1 - 5 operations. Four patients presented with uterine prolapse with a large grade 2 - 3 enterocele. In 3 of these cases hysterectomy was performed followed by sacrocolpopexy. In the remaining patient, a 28-year-old woman, para 1, gravida 1, and desirous of further pregnancy, the uterus was conserved and the sacrocolpopexy patch was placed between the S1 midline and the cervicovaginal junction posteriorly.

The different components of the operations are listed in Table I. In 4 patients a suburethral sling was inserted at the time of surgery, 1 patient underwent anterior colporrhaphy for a grade 2 cystocele, and 60 patients (23%) had a posterior colporrhaphy. The main additional operation components were Burch vesicosuspension (106 patients, 40%) and pouch of Douglas occlusion (245 patients, 94%).

Table I. Different components of the operations performed

	N	%
Sacrocolpopexy	262	100
Halban-type pouch of Douglas occlusion	245	94
Burch vesicosuspension	106	40
Anterior repair	1	0.4
Posterior repair	60	23
Suburethral sling placement	4	1.5

Operative complications are listed in Table II. Few complications were encountered, the majority being medical complications referring to the general medical condition of the patient, and the remainder reflecting the many events of previous surgery in these patients. In particular no presacral vessel bleeding was encountered. Blood loss during the procedures was very low and no pelvic vessel injuries occurred. Of the 3 patients with intestinal obstruction in the immediate postoperative period, 1 patient had an elbow of bowel caught in tissue folds leading to subacute obstruction. Simple release at laparotomy resulted in a complete reversal. The remaining 2 patients had bowel obstruction found to be caused by fibrous bands in sites of previous surgery — 1 in the adhesions of a previous cholecystectomy and 1 in the pelvis after 2 previous laparotomies.

Table II. Operative complications in 262 sacrocolpopexy operations

Operative complication	*N*
Minor bladder injury	3 (immediately repaired)
Minor small-bowel injury	1 (immediately repaired)
Units of blood used	5 (including 2 units for anticoagulant-caused bleeding)
Intestinal obstruction	3 (2 in area of previous surgery, 1 internal hernia with incomplete obstruction)
Medical and other complications	7 (1 pneumonia, 3 prolonged ileus, 2 arrhythmia, 1 left ventricular failure)
Erosion of patch during follow-up	10 (2.6%)

All patients were followed up. If follow-up was done by the referring doctor, patient progress was communicated to the authors by letter, report, telephone call or personal statements. All patients with subsequent problems were referred back. The minimum follow-up period was 16 months. The success rate of sacrocolpopexy was 98.8% as shown in Table III. None of the patients with rectocele or cystcoele found at later consultations had been diagnosed with those disorders at the time of operation.

The finding of erosion of the patch through the vaginal vault is of great importance. Patients with this complication presented during follow-up with low-grade pain and a malodorous and persistent vaginal discharge. Erosion was found in 10 cases (2.6%), invariably within the first year of follow-up. All patients received a course of systemic and topical antibiotics and the mesh was removed. In 7 cases this was done through laparotomy while in 3 cases the patch could be removed transvaginally by gentle pulling. No patient had residual sepsis, other pathology or recurrent vault prolapse. An attempt to define a risk group for patch erosion highlighted a high number of previous prolapse operations, concurrent hysterectomy, and high suspension tension of the patch at the time of placement.

Discussion

This large series of 262 consecutive sacrocolpopexy procedures demonstrates the safety and effectiveness of the procedure. Vaginal vault prolapse is a debilitating disorder and although not a life-threatening condition has a highly negative impact on the quality of life. To determine the exact impact on bowel and bladder symptoms requires a separate quality-of-life analysis that was outside the scope of this analysis. An effective procedure will relieve the prolapse. Baessler and Schuessler[11] found that more than 70% of patients obtained relief of bowel symptoms and that 28% of patients developed postoperative outlet constipation. All patients had relief of dyspareunia. Cure rates of vaginal vault prolapse of more than 90% have been described[2,3,7,11,12] and the results of this analysis compare favourably with the reported series.

The very low occurrence of intraoperative complications illustrates the safety of the procedure if bleeding can be avoided. As the procedure calls for retroperitoneal access and

Table III. Success rate of sacrocolpopexy*

	N
Repeat vault prolapse Case 1. A very obese patient with a severe bowel evacuation defect: colpocleisis subsequently successfully performed Case 2. A patient who lifted her paraplegic husband out of the bath: patch was found to have torn off the vagina only: repaired successfully Case 3. Initial dura mater sacrocolpopexy failure: subsequent successful Gore-tex repair	3 (success rate 98.8%)
Repeat enterocele with high vaginal vault All were subsequently repaired with sacrospinous ligament fixation	4
Cystocele Both were subsequently repaired through needle vesicosuspension procedures	2
Rectocele All repaired by posterior colporrhaphy	6
Incisional hernia Since repaired	1
Number of patients requiring further surgery	16 (6%)

*Success rates for all patients followed up (minimum of 16 months).

work, the surgeon must be at ease in this area. Only 3 patients out of 262 received blood transfusion. In 1 case prophylactic use of fragmented heparin contributed to bleeding requiring transfusion of two units of blood. Medical disorders caused the major problems in the postoperative period. This calls for preoperative optimalisation of patients as far as possible.

The rate of erosion of the patch was reported to vary between 5.5%[5] and 8.7%.[13] The technique used by Visco *et al.*[5] differs markedly from the technique reported on in this analysis in that sutures holding the patch were also placed low down in the rectovaginal septum. Erosion is a chronic process where the vaginal insertion of the patch probably retracts or undergoes necrosis. The impact of tension is regarded as the most important in the causation of erosion. Assessment of tension of the suspension intraoperatively is a matter of judgment and errors may occur. Although the rate of erosion found in this analysis was only 2.6%, it still represents a most undesirable complication. Removal of the patch is indicated and the vaginal discharge and pelvic pain and discomfort cease within weeks.

The performance of more than one procedure in the majority of the patients reflects the complexity of the problem in individuals. In part it explains why randomised controlled trials for different surgical procedures for vaginal vault prolapse are very difficult to conduct. With current data available[1-3] the performance of occlusion of the pouch of Douglas should be regarded as inherent to the operation, and patients for vesicosuspension of posterior colporrhaphy should be selected according to the clinical presentation.

Abdominal sacrocolpopexy forms an important part of the surgical repair of vaginal vault prolapse with a low complication rate as well as erosion rate of the patch.

References

1. Toozs-Hobson P, Boos K, Cardozo L. Management of vaginal vault prolapse. *Br J Obstet Gynaecol* 1998; **105:** 13-17.
2. Van Lindert ACM, Groenendijk AG, Scholten PC, Heintz APM. Surgical support and suspension of genital prolapse, including preservation of the uterus, using Gore-Tex soft tissue patch (a preliminary report). *Eur J Obstet Gynecol Reprod Biol* 1993; **50:** 133-139.
3. Timmins MC, Addison WA, Addison SB, Cavenar MG. Abdominal sacral colpopexy in 163 women with posthysterectomy vaginal vault prolapse and enterocoele. Evolution of operative techniques. *J Reprod Med* 1992; **37:** 323-327.
4. Richter K, Albrich W. Long term results following fixation of the vagina on the sacrospinal ligament by the vaginal route. *Am J Obstet Gynecol* 1981; **141:** 811.
5. Visco AG, Weidner AC, Barber MD, *et al.* Vaginal mesh erosion after abdominal sacral colpopexy. *Am J Obstet Gynecol* 2001; **184:** 297-302.
6. Lane FE. Repair of posthysterectomy vaginal vault prolapse. *Obstet Gynecol* 1962; **20:** 72-76.
7. Barrington JW, Calvert JP. Vaginal vault suspension for prolapse after hysterectomy using an autologous fascial sling of rectus sheath. *Br J Obstet Gynaecol* 1998; **105:** 83-86.
8. Swift SE, Herring M. Comparison of pelvic organ prolapse in the dorsal lithotomy compared with the standing position. *Obstet Gynecol* 1998; **91:** 961-964.
9. Report of the RCOG Working Party on prophylaxis against thromboembolism in Gynaecology and Obstetrics. London: Royal College of Obstetricians and Gynaecologists, 1995.
10. Nichols DH. Enterocoele. In: Nichols DH, ed. *Gynecologic and Obstetric Surgery.* St Louis: Mosby, 1993: 420-430.
11. Baessler K, Schuessler B. Abdominal sacrocolpopexy and anatomy and function of the posterior compartment. *Obstet Gynecol* 2001; **97:** 678-684.
12. Geomini PMAJ, Brolmann HAM, Van Binsbergen NJM, Mol BW. Vaginal vault suspension by abdominal sacral colpopexy for prolapse: a follow up study of 40 patients. *Eur J Obstet Gynecol Reprod Biol* 2001; **94:** 234-238.
13. Kohli N, Walsh PM, Roat TW, Karram MM. Mesh erosion after abdominal sacrocolpopexy. *Obstet Gynecol* 1998; **92:** 999-1004.

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