Traumatic cloacal defects are rare and are characterised by complete dehiscence of the anterior sphincter complex, the perineal body and lower portion of the rectovaginal septum. Techniques of repair range from simple tissue apposition to complex flap reconstruction. We report a series of patients treated by a ‘Warren flap’.


Results. The Warren flap was performed with minimal complications. Patients were discharged within 2 days. Minor wound infections occurred in all four cases. At median follow up of 7.5 months (range 3-10 months) all patients had significantly improved continence (Vaisey score median 16 pre-op to 3 post-op) and sexual function.

Conclusions. The Warren flap procedure utilises techniques and planes that are familiar to the colorectal surgeon, and is associated with rapid and safe recovery and good early postoperative function. It is a useful reconstructive technique for this complex injury.

Key words: traumatic cloacal defect, perineal trauma, anterior sphincter repair
continence from mechanical sphincter damage (4). Deterioration in function with time following repair has led many to recommend alternative conservative management (5-8). Due to the extent of injury, many patients with a cloacal defect do not respond to conservative measures. A simple overlap sphincter repair may be inadequate. In addition to reconstruction of the perineal body, the rectovaginal septum also needs repair, with adequate interposition of skin and levator and anal sphincter muscle between the anorectum and vagina.

A variety of reconstructive techniques have been described (3, 9, 10, 11). All involve sphincter repair with or without levatorplasty. Techniques of skin closure vary from simple transverse or longitudinal closure, to more complex Z-plasties, island advancement flaps and X-flaps.

We report a series of 4 patients with the Warren flap (12, 13). The advantages and outcomes of this relatively simple reconstruction involves using tissue planes and techniques already familiar to the colorectal surgeon, and results are comparable with reported outcomes using alternative reconstructive techniques.

PATIENTS AND METHODS

All four patients who underwent a Warren flap repair are included in the study. All patients underwent a thorough clinical examination and had preoperative anorectal manometry and endoanal ultrasound. The Vaisey continence score was used to measure the degree of incontinence preoperatively and postoperatively.

The Warren flap: operative technique

Each patient received a phosphate enema and a single dose of prophylactic broad-spectrum antibiotics. Patients were placed in the lithotomy position (fig. 1). The planned dissection was marked on the skin of the posterior vaginal wall above the apex of the defect, the height the proposed triangular vaginal flap gauged according to the degree of septal disruption.

A Parks’ retractor was inserted into the vagina to provide good exposure and splint the posterior vaginal wall, which was then infiltrated with generous amounts of 1:300,000 adrenaline and saline. Diathermy was used to mobilise the vaginal flap with exposure of the rectovaginal septum (fig. 2). The flap was mobilised well laterally each side towards the anal verge to create a triangular segment of well vascularised vaginal wall (fig. 3), with the apex of the cloacal defect left undisturbed to form the distal base of the triangular skin flap prior to inversion around the subsequently

Fig. 1. Patient placed in lithotomy position. The perineum is totally deficient leaving a thin bridge of scarred skin between the rectum and vagina. The cloacal defect is less evident in this image due to lateral retraction of the skin each side

Fig. 2. The vaginal skin is mobilised as an inverted triangular flap using diathermy after infiltration
reconstructed sphincter. The incision was extended laterally, sufficient to expose the disrupted ends of the external sphincter.

The levator muscles were apposed using interrupted prolene sutures and an overlap sphincter repair carried out using four interrupted 2/0 PDS mattress sutures (13) (fig. 4). The flap was inverted and drawn posteriorly around the reconstructed external sphincter and then brought anteriorly to cover the inferior aspect of the reconstructed perineum. The internal sphincter was not identifiable separately in any case. After meticulous haemostasis the vaginal flap was sutured to the perineal skin on each side using interrupted vicryl, in a V-Y fashion to allow restoration of the perineum with a tension free closure. The vaginal skin defect was closed longitudinally, carefully checking digitally that there was no stenosis, the lower end apposed to the apex of the inverted flap. If necessary, the wound was left partially open and drained for 48 hours (fig. 5 and 6).

Patients were given non-constipatory analgesia and aperients to avoid faecal impaction. Wound inspection was carried out at 2 weeks.

CASE REPORTS

1. A 35-year old female presented 4 months after an apparently normal vaginal delivery. At

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Fig. 3. The flap (dotted arrow) has been fully mobilised and retracted to expose the levators and disrupted sphincter complex (arrows). These are repaired in the standard overlap fashion.

Fig. 4. Line diagram illustrating the levatorplasty and overlap sphincter repair. Exposure is superb due to the extensive mobilisation of the posterior vaginal wall.

Fig. 5. After repair of the defect. There is a significant restoration of the perineal body and skin. A small tube drain may be left for 24-48 hours.
the time of presentation her main complaint was leakage of faeces and flatus into the vagina. She had a Vaisey continence score of 20/24. Examination revealed a traumatic cloaca. Investigations confirmed low resting and squeeze pressures with a large internal and external sphincter defect anteriorly. A Warren flap repair was carried out and she was discharged from hospital on the 3rd post-operative day. Apart from a minor wound infection requiring antibiotics, there were no post-operative complications and she resumed normal sexual activity at about 3 months. At review at 10 months she was fully continent with a Vaisey score of 0/24.

3. A 21-year old female presented 14 months after a difficult forceps delivery of her first child. She had a Vaisey continence score of 20/24. Examination revealed a traumatic cloaca. Investigations confirmed low resting and squeeze pressures with a large internal and external sphincter defect anteriorly. She underwent an uncomplicated Warren flap repair and was discharged 2 days after admission. She presented 1 week after surgery with a purulent discharge from the drain tract and was given broad-spectrum antibiotics with rapid resolution. Review at 3 and 9 months confirmed significantly improved continence with a Vaisey score of 7/24. She had resumed sexual intercourse but had some minor dyspareunia.

2. A 21-year old female presented 14 months after a difficult forceps delivery of her first child. A primary repair of a 3rd degree tear carried out post-partum was complicated by a wound infection and dehiscence leaving a cloacal defect. Despite the severity of the defect she was mainly continent but urgency was a problem with a Vaisey score of 12/24. She also had significant dyspareunia. Investigations confirmed very low resting and squeeze pressures with a large internal and external sphincter defect anteriorly. A Warren flap repair was carried out and she was discharged from hospital on the 3rd post-operative day. Apart from a minor wound infection requiring antibiotics, there were no post-operative complications and she resumed normal sexual activity at about 3 months. At review at 10 months she was fully continent with a Vaisey score of 0/24.

3. A 24-year old female sustained a tear during her first delivery, which required forceps and had an uneventful primary repair. She had a traumatic second delivery without forceps. A primary repair was carried out but she presented to the colorectal surgeons 4 months later with flatus per vagina and menstruating ‘per rectum’. Her Vaisey score was 10/24. Examination revealed a cloacal defect. Anorectal physiology confirmed low resting and squeeze pressures with endoanal ultrasound showing a large anterior sphincter defect. She underwent a Warren flap repair and was discharged the next day. Post-operative recovery was complicated by a minor wound infection. On review at 3 months she was fully continent with a Vaisey score of 0/24. She was able to resume normal sexual activity at 4 months.

4. A 39-year old female sustained a 3rd degree tear after the forceps assisted birth of her first. She tolerated her symptoms for 2 years by changing her diet, taking regular loperamide and using pads but presented to clinic with deteriorating incontinence on a daily basis. She scored 24/24 on the Vaisey score. She had low resting and squeeze pressures with a large anterior sphincter defect. She underwent a standard overlap sphincter repair. Unfortunately the repair dehisced soon after and the perineal skin broke down to form cloacal type defect. A trial of sacral neuromodulation was unsuccessful and she consented to a Warren flap repair. Although review in clinic 6 weeks later showed no evidence of infection, she received a short course of antibiotics from her general practitioner during this time for a perceived minor wound infection. On review at 5 months she had improved significantly with only minor seepage post defaecation on occasions with a Vaisey score of 5/24. For this she still wore...
pads. She was able to resume sexual activity at 3 months.

**DISCUSSION**

Cloacal defect from obstetric trauma is rare (2). Despite such a significant defect, the literature suggests many patients do not present to their doctors, or the condition remains unrecognised for many years (9). This was not the case in our small series, all patients presenting within a few months of vaginal delivery.

Notwithstanding successful conservative therapy in some patients with sphincter injury, the extent of tissue damage associated with a cloaca defect necessitates attempted reconstruction in most patients. Simple reseparation of the rectum and vagina with restoration of the perineum is beneficial socially and psychologically for most and in itself provides some functional improvement (14). Although several techniques have been described, all have been combined with sphincter reconstruction (3, 9, 10, 11). The main variation in technique revolves around the mode of skin closure.

The simplest technique of skin closure involves primary closure without the need for flap formation. The two largest studies on repair of traumatic cloaca describe this technique with transverse incisions being closed in a longitudinal fashion (3, 10). Both detail excellent results with surprisingly minimal complications. Significant perineal pain and dyspareunia were seen in about 15% of patients in one series and the closure was described as ‘difficult’ in the other.

Both of these series were published over 14 years ago; follow up was either short or unspecified, outcomes were sparsely reported and no validated continence system was utilised, making comparison difficult. A more recent publication, again utilising transverse to longitudinal primary closure or allowing wound healing by secondary intention, has reported more detailed outcomes. Wound breakdown occurred in 14% but all were managed conservatively and healed within 4 months. Fistula formation occurred in 10% all requiring surgical intervention. Most patients were defunctioned. After a very respectable follow up median of 5 years continence to solid stool had been restored in all patients with incontinence to liquid stool and flatus persisting in 50% and 60% respectively (15).

The authors of this recent case series argue that there is no need to form skin flaps to reconstruct the perineal skin. They suggest that the original injury does not result in skin loss, only tissue displacement laterally. However, all other publications this century advocate the need for skin flaps in order to reduce the potential for wound breakdown and tissue tension, which may result in perineal pain and dyspareunia. In simple repairs the rate of dehiscence may be as high as 40% (16).

Various skin flap procedures have been described. Draganic and Solomon (11) used island skin flaps from the sides of the perineum. Primary healing was achieved in 3 of 4 patients. However, 75% of patients were defunctioned. No details were given about hospital stay. Kaiser described a series of 12 women who had skin closure with X-flaps. This

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technique requires extensive lateral perineal incisions. Continence improved dramatically in all patients. However, despite an external compression dressing, in-patient bedrest for 5 days, wound complications were common with minor infection occurring in 66%. A fistula occurred in 3 patients, one of who was defunctioned and required further repair, but all healed eventually. Forty percent had dyspareunia, which eventually resolved in all but one patient after a long term follow up. More recently, Altomare (17) described the use of a modified Lotus petal flap for reconstruction. Although excellent results were reported as with the X-flap the procedure requires extensive skin mobilisation and a protracted hospital stay. One further report described the use of a Z-plasty in 6 patients with restoration of perfect continence in 5 after a median of 14.6 months. There was 1 seroma, 1 infected wound and one fistula in this series (18).

Reconstruction of the rectovaginal septum, sphincter complex and perineal body makes standard skin closure without tension difficult. We feel a flap procedure is therefore desirable. Although the literature would suggest comparable short and long-term results with simple closure, data from the older studies is difficult to extrapolate. In the more recent study a significant wound breakdown and fistula formation rate was seen despite 65% being de-functioned (15). The Warren flap was described over 100 years ago ‘to protect repairs of the lacerated rectum and anus’ (13). More recently a modified technique was used to treat 5 patients with a traumatic cloacal defect (12). In all 5 patients the repair gave excellent anatomic and functional results but further short-term outcome data were not provided.

We revisited the technique as a simple and effective way of reconstructing the damaged perineum to achieve good tension-free skin coverage. The procedure requires significantly less additional perineal dissection than other reported flap procedures. Entry into the familiar rectovaginal septal plane through the posterior vaginal wall is facilitated by copious infiltration of dilute adrenaline plane and, together with curvilinear anterior perianal extension of the incision, provides excellent exposure for identification of the disrupted sphincter and levators. The vaginal approach to the sphincters and avoidance of breeching of the anal skin and mucosa mean theoretically fistula formation is less likely. V-Y skin closure is possible without tension, and if necessary leaving the perineal wound partially open to heal by secondary intention. Healing is usually rapid and patients do not require to be defunctioned or have complex wound management and a protracted hospital stay. Each of our patients went home within 2 days of surgery. Although all patients had early minor wound infections, these all resolved uneventfully.

**CONCLUSION**

Treatment of a cloacal defect arising from obstetric trauma can be challenging. Many different techniques have been described apparently with good functional results. No one procedure has been shown to be superior. The Warren flap utilises techniques and planes that are familiar to the colorectal surgeon, and is associated with rapid and safe patient recovery and good functional results. We feel it should be part of the surgical armamentarium.

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