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Review Article

Plastic Surgical Techniques in the Repair of Vesicovaginal Fistulas: A Review

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Abstract: A variety of plastic surgical techniques may be used in the repair of vesicovaginal fistulas. The indication for their use include: (a) diameter greater than 4 cm; (b) involvement of the bladder neck/proximal urethra; (c) radiation-induced fistulas; and (d) previous failed repair(s). In the developing world the vast majority of complex fistulas are caused by obstetric trauma; elsewhere they occur mainly following radiotherapy or radical surgery for gynecologic malignancy. The majority of complex fistulas requiring tissue donation may be effectively treated using a vaginal approach and a modified Martius graft. There is probably little or no advantage in encorporating bulbocavernosus muscle fibers in this graft. Although some concern exists regarding the long-term viability of these grafts in radiation-induced fistulas, in view of the relatively simple operative technique, together with the low associated morbidity, modified Martius grafts may be deemed suitable for first-time repairs. The gracilis muscle graft should be considered next in cases of exclusive transvaginal repair. The omental graft is undoubtedly the most versatile: it can be used in both abdominal and combined abdominovaginal procedures. The recently described posterosuperior sliding bladder flaps warrant further evaluation. For most fistulas involving the bladder neck/proximal urethra, there is no clear advantage in bladder flap reconstruction over vaginal flap reconstruction, the latter being augmented by an anti-stress incontinence procedure were appropriate. When continent urinary diversion is required, the Indiana pouch appears preferable to the Kock pouch; ureterosigmoidostomy is, however, technically and culturally more acceptable in these circumstances in the developing world.

Keywords: Surgical flaps; Surgical grafts; Vesicovaginal fistulas; Urinary incontinence

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Introduction

A variety of plastic surgical techniques may be used in the treatment of vesicovaginal fistulas. The indications for their use include: (a) diameter greater than 4 cm; (b) involvement of the bladder neck/proximal urethra; (c) radiation-induced fistulas; and (d) previous failed repair(s). In the developing world the vast majority of complex vesicovaginal fistulas are caused by obstetric trauma; elsewhere they occur mainly following radiotherapy or radical surgery for gynecologic malignancy. These fistulas present a considerable challenge to both gynecologists and urologists alike. Simple repair by tissue approximation is often impossible, due to the extent of tissue destruction and cicatrization; even if possible, such repairs are doomed to failure because of devascularization. The following review attempts to summarize the various plastic surgical techniques that may be employed in the repair of such fistulas.

Labial Grafts

In 1834, Jobert de Lamballe succeeded in closing a small number of vesicovaginal fistulas using pedicled labial skin flaps; he termed this innovative technique 'autoplastie vaginale par la méthode indienne' [1]. Later he developed a second technique, 'autoplastie par glisse-

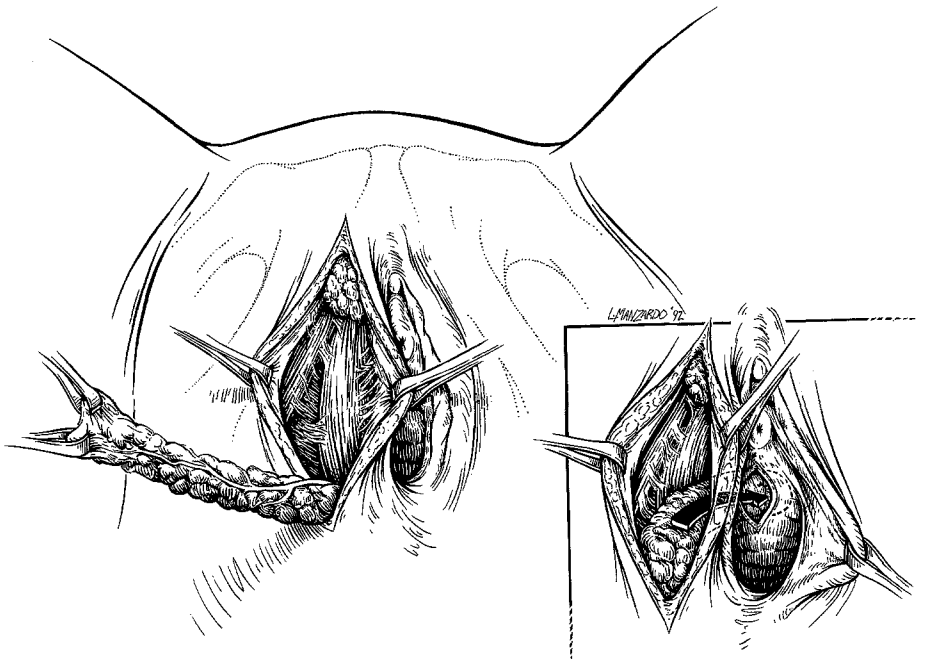

Fig. 1. Labial fibroadipose graft (with underlying intact bulbocavernosus muscle).

ment ou locomotion', which involved dissecting the bladder from the cervix and vagina with the additional use of curved relaxing incisions in the vagina to facilitate mobilization and low-tension closure of tissue planes [1] Although Noble in 1901 reported the use of labial grafting in neourethral construction, it was not until after 1928 that tissue grafting became accepted as an integral part of the surgical repertoire of fistula repair [2].

In 1928, Martius described the use of a unilateral ischiocavernosus/bulbocavernosus muscle graft in the repair of a large vesicovaginal fistula [3]. The muscles were exposed through a vestibular incision, detached from their origins, placed beneath the bladder neck and reattached to the opposite pubic ramus. The vaginal incision was then closed. Martius postulated that this muscle graft would improve continence by providing both mechanical support and adjunctive sphincteric activity to the bladder-neck region. Additional benefits of this operation included the separation of bladder/urethra and vaginal suture lines, reduction of dead space, and neovascularization [4]. Martius later modified the technique [5,6]: using a vertical incision over the labium majus, the bulbocavernosus muscle (and in certain descriptions just the overlying fibroadipose layer) was mobilized on a superior pedicle, tunnelled subcutaneously and fixed to the site of fistula repair. With large fistulas, when low-tension closure of the vagina was not possible, Martius used the graft as a tissue substitute [5,6]. Although Birkhoff et al. recommended that this type of graft should be used in the repair of all fistulas, Martius insisted that its use should be restricted to the more complicated cases [5–7].

Elkins et al. achieved an 86.5% success rate using a modified version of the Martius graft in the repair of 37 complex fistulas in 35 patients [8] (Fig. 1). Anatomical dissection of this graft is a cadaver revealed it to be composed of fibroadipose tissue from the labium majus without any bulbocavernosus muscle fibers. Vascular branches entering the graft area were traced to their origins and identified. The arterial vascular supply is from the external pudendal artery anteriorly and the internal pudendal artery posteriorly, these vessels forming a rich plexus within the graft. Symmonds had earlier postulated that this well vascularized fibroadipose layer is in fact the essential part of the transplant, and not the bulbocavernosus muscle [9]. Excluding the latter structure from the graft obviates the risk of injury to the vestibular bulb, and this most likely explains the low incidence of hemorrhage in this procedure [8]. Elkins et al. stress that the labial fibroadipose graft is an adjunctive repair technique; it does not preclude the general principles of fistula closure, i.e. layered dissection, mobilization of tissues, atraumatic technique, absolute hemostasis and low-tension closure. In addition, the graft does not provide adequate mechanical support or sphincteric activity for the bladder neck and is therefore an indadequate prophylaxis per se against postoperative stress incontinence, additional measures being indicated when necessary. Although successful closure has been achieved using this technique even in fistulas presenting many years radiotherapy, the long-term viability of these grafts is not fully known [10]. Recurrence of a radiation-induced rectovesicovaginal fistula 17 years after successful Martius grafting has been reported by Aarsten and Sindram [11].

In 1982 Leuchter et al. reported the use of a bulbocavernosus myocutaneous graft for the closure of a perineal hernia which developed after pelvic exenteration [12]. In 1984 Symmonds described two types of

bulbocavernosus myocutaneous grafts as adjunctive techniques in the repair of bladder-neck fistulas [13]. One type involved the medial rotation of a pedicled labium majus skin flap with the underlying muscle; the second type involved the subcutaneous tunnelling of a bulbocavernosus muscle pedicle with an attached overlying skin island. Hoskins et al., using a modification of the latter technique, successfully closed two difficult genitourinary fistulas associated with extensive tissue loss and fibrosis [14]. The midportion of the labium majus is incised as described previously by Martius. It is important to confine the labial surgery to the medial, hairless part of the labium majus. In the upper third of the labium an island of skin is circumscribed in continuity with the above incision. The authors underline the importance of securing the cutaneous island to the underlying fibroadipose pad and bulbocavernosus muscle to prevent the avulsion of the delicate perforating vessels. The superior part of the bulbocavernosus muscle with its attached cutaneous island is then mobilized, tunnelled subcutaneously and anchored to the area of the urethra/bladder suture line. Excess skin is then excised and the graft is sutured to the surrounding vaginal mucosa. In cases with considerable tissue loss, requiring a large graft, the viability of the cutaneous island may be tested after mobilization and before grafting by the intravenous injection of fluorescein dye with subsequent examination of the area under Wood's light [14].

Falandry reported the use of labial myocutaneous grafts in 14 women with large obstetric-related fistulas, 5 of whom had associated rectovaginal fistulas and 4 of whom had anal sphincter tears [15]. A successful outcome was achieved in 10 cases, 7 after one attempt and 3 after two attempts (using contralateral grafts in the latter group).

Gracilis Muscle Grafts

The gracilis muscle is part of the adductor group of thigh muscles. It is a thin strap-like muscle which passes from the lower symphysis pubis and the medial portion of the pubic ramus to the upper medial tibia. Its specific action is to adduct, flex and medially rotate the hip; it can be sacrificed, however, without noticeable diminution in voluntary mobility because of the compensatory action of the other adductors. The main arterial blood supply is a branch of the profunda femoris and/or the medial circumflex femoral artery. The dominant artery/arteries together with associated venae comitantes and a sensorimotor branch of the obturator nerve enter the lateral border of the gracilis muscle between the adductors longus and magnus approximately 7–12 cm from the pubic tubercle [16,17]. A smaller artery enters the muscle 6–8 cm from the distal insertion [17]. In 1 out of 19 dissections Ingleman-Sundberg found the latter to be the dominant arterial supply, thus rendering the muscle unsuitable for proximal grafting [17]. Doppler ultrasound may be used intraoperatively to locate these vessels [18]. In the event of a dominant distal vascular pedicle supplying the gracilis muscle, Ingleman-Sundberg recommends the use of the adductor magnus [17]. Byron and Ostergard have also reported the successful use of a sartorious muscle graft for the treatment of a radiation–induced fistula [19].

In 1928 Garlock described the successful use of a gracilis muscle graft in the treatment of an intractable urethrovesicovaginal fistula [20]. The fistula measured 2 cm in diameter and the bladder was replaced by dense scar tissue measuring 5 mm in thickness. The vaginal mucosa was atrophic and lined with encrusted urinary salts. Three previous attempts to repair the fistula had been made. After mobilizing the bladder-neck fistula, the author made a longitudinal incision on the medial side of the right thigh, exposing the gracilis muscle. The muscle was cut close to its insertion, sacrificing the distal vascular supply while maintaining the dominant proximal supply (Fig. 2). The superior part of the thigh incision was made continuous with the vaginal incision by cutting transversely across the vulva. The gracilis muscle was then placed at the bladder neck over the repaired fistula and anchored in place with fine interrupted chromic catgut sutures (Fig. 3). The vaginal incision was then closed over the muscle graft. Postoperatively the thighs were kept immobilized for a period of 24 days by placing a triangular plaster mold between them.

Ingelman-Sundberg modified this operation by bringing the gracilis muscle into the vagina through a perforation in the obturator membrane [17]. He emphasized the importance of avoiding trauma to the obturator nerve and vessels, in addition to creating a sufficiently large opening in the membrane so as not to strangulate the graft's blood supply. Later, Nicholson and Hamlin simplified the technique by tunnelling the reflected gracilis subcutaneously from the apex of the thigh incision to the fistula site [21]; this has become the standard operative technique for this type of graft.

Fleishmann and Picha described the use of gracilis muscle interposition in the abdominal repair of vesicovaginal fistulas. They transferred the muscle from the upper thigh incision to the space of Retzius by penetrating the endopelvic fascia [22]. They recommend that the donor leg should remain immobilized in an adducted flexed position for 3 days post-surgery; in addition, a closed suction leg drain should be used, it being removed on the 5th day. Perioperative dextran 70 or low-dose subcutaneous heparin may lessen the risk of thromboembolism; above-knee antithrombotic stockings should not be worn on the donor leg as they may impair the graft's blood supply.

Heckler et al. [23] reported 10 cases of complex fistulas in children which were repaired using gracilis muscle grafts. No failure was noted in follow-up periods of between 1.5 and 6 years.

A further modification of the gracilis graft involves the use of an overlying cutaneous island to close large defects [24]. Using this technique, Heckler et al. achieved a cure in all 5 patients with large radiation-

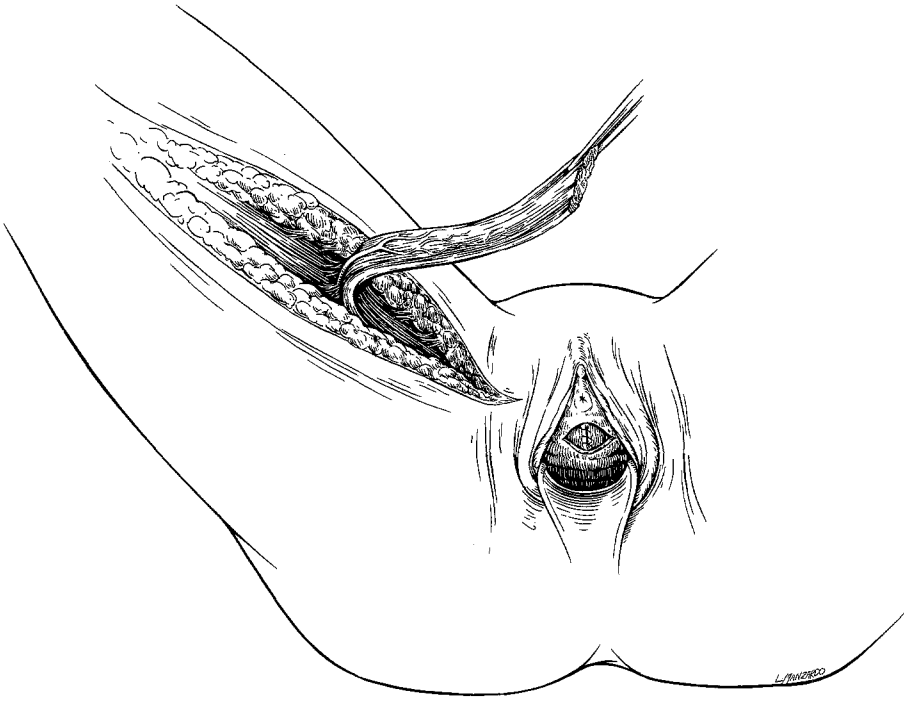

Fig. 2. Mobilization of gracilis muscle graft on its proximal vascular pedicle.

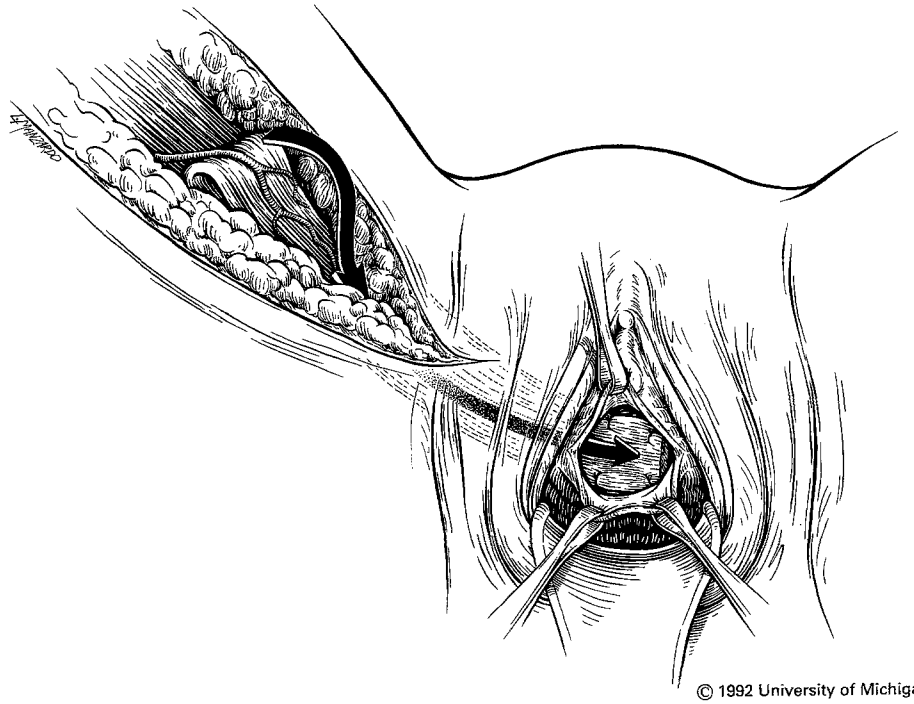

Fig. 3. Gracilis muscle graft anchored to site of vesicovaginal fistula closure.

induced fistulas, in each of whom previous repair(s) had failed. Although breakdown of the skin wound occurred in 3 cases, the underlying urethral/bladder repairs remained intact, protected by the interposed muscle.

Rectus Abdominis Grafts

The blood supply of the rectus abdominis muscle is derived from the superior and inferior epigastric arteries. This muscle may be used on its inferior vascular pedicle for the repair of genitourinary fistulas. It is exposed through a suprapubic incision, transected across one of its tendinous intersections, mobilized, brought into the space of Retzius and anchored securely to the site of fistula repair [25]. Failure to anchor the graft may result in surgical failure due to muscle retraction [25]. Menacha et al. reported a successful outcome in 3 women with large intractable fistulas [25]. At first the authors considered the use of a gracilis graft in each case, but in view of the high juxtaureteral position of the fistulas, it was deemed more appropriate

to use the rectus muscle in a combined abdominovaginal approach. In addition, they considered the use of omental grafting to be a more radical technique in this context, obviously in view of the longer abdominal incision required and the need for more extensive intraperitoneal dissection (although this is not stated).

Peritoneal Flaps

In the transabdominal repair of vesicovaginal fistulas, the bladder and vaginal suture lines may be effectively separated by the use of two interposed reflected flaps of pelvic peritoneum, which are mobilized anteriorly and posteriorly and then anchored distal to the respective suture lines [26]. This form of graft is simple to perform; it is not, however, suitable for either large or devascularized defects.

Omental Grafts

The rich blood supply of the greater omentum is derived from the right and left gastroepiploic arteries, which anastamose along the greater gastric curve. Because of its vascularity and position it is eminently suitable for use as a graft in the transabdominal repair of vesicovaginal fistulas. Mobilization is achieved by separating the omentum from the underlying transverse colon and from its attachment to part of the stomach; the dominant right gastroploic artery is most commonly used to create the vascular pedicle. Further lengthening can be achieved by creation of a J flap, with the careful division of vessels based on the arterial arcade; these flaps invariably reach the periurethral areas [27]. The omental pedicle is fixed to the paracolic gutter to obviate the risk of small-bowel obstruction (Fig. 4).

The use of omental grafts in fistula repair was first

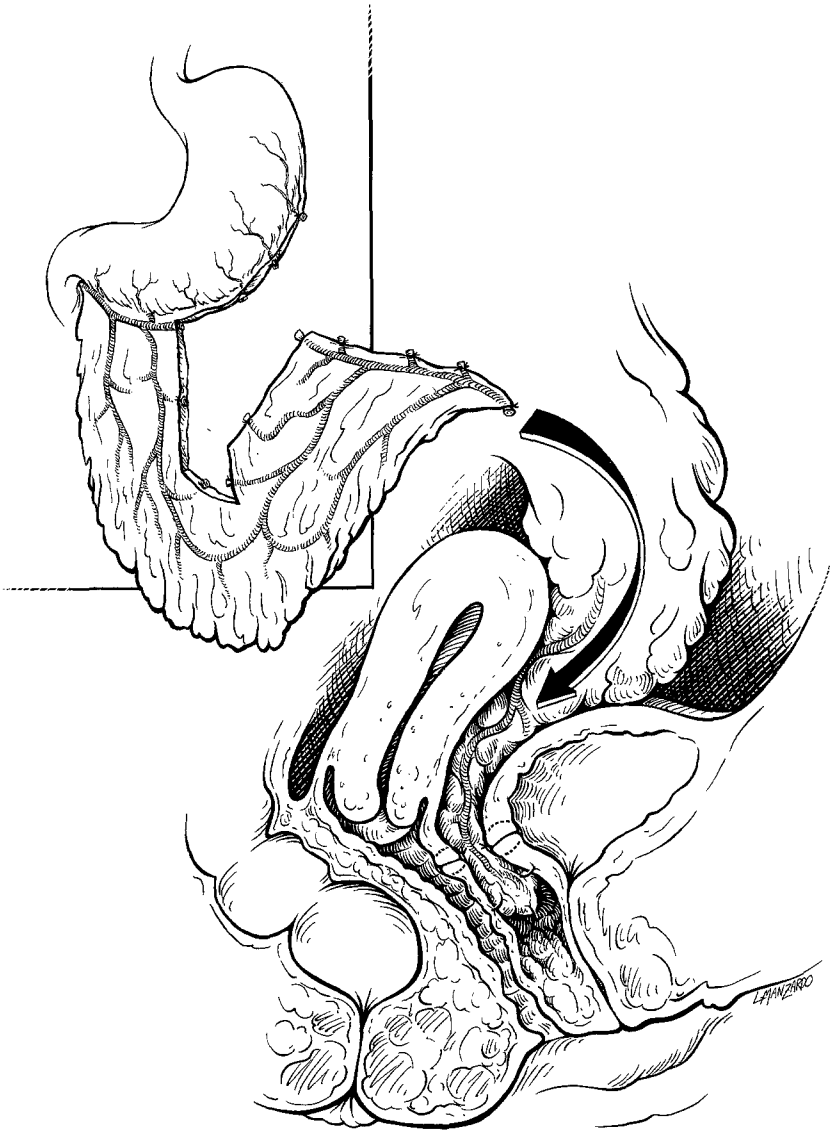

Fig. 4. Mobilization and anchoring of an omental graft in the transabdominal repair of a vesicovaginal fistula.

reported by Kiricuta and Goldstein in 1972 [28]. Since then it has been used with considerable success. Using a combined abdominovaginal approach, Orford and Theron successfully repaired 52 and 59 fistulas using this technique [29]. The omentum has also been used as a suburethral sling in cases of urethrovaginal fistulas, the graft being fixed to the symphysis pubis [30]. In circumstances where the vagina cannot be closed due to extensive tissue destruction, the omentum can be used as a patch, epithelialization occurring over its surface [31]. There is some experimental evidence to support a similar role in large bladder defects [31,32]. According to Zacharin, the omental graft has an important role to play in the closure of vesicocervical fistulas [33]. In addition, they have been used prophylactically in patients undergoing pelvic surgery who are at high risk of fistula formation. Petty et al. applied the graft to the vaginal cuff and the bladder base at the time of hysterectomy in 5 women who had previously been treated with pelvic irradiation; no fistulas developed in this group. The authors attribute this success to the graft-induced neovascularization [34]. Because of its rich vascular and lymphatic supply, together with its resistance to infection, the omental graft is particularly suitable in the context of large defects, devitalized tissues, and where wide dissection makes the collection of exudate and blood likely, with the attendant risk of secondary infection [27].

Plastic Techniques for Proximal Urethral/ Bladder-Neck Fistulas

Fistulas involving the bladder neck and proximal urethra are most often a consequence of prolonged unsupervised labor and are complicated by considerable tissue loss, fibrosis and fixity to bone; they may also follow anterior colporrhaphy or surgery for urethral diverticula. Because of the sphincteric damage, the provision of postoperative continence remains a considerable challenge. There are two fundamental surgical approaches to this problem: neourethral construction from either vaginal flaps or bladder flaps. The former technique is usually accompanied by an anti-stress incontinence procedure, performed either synchronously or at a second operation if required.

Vaginal Flaps

In 1901, Noble constructed a neourethra using vaginal skin flaps [2]. Making deep incisions on either side of the long axis of the proposed urethra, he closed the flaps over a narrow-bore catheter, thus creating a urinary conduit. A similar technique was reported by Harris in 1935, this time using a U-shaped incision [35]. Moir added the use of suburethral buttress sutures to improve continence [36]. Symmonds achieved continence in 14 out of 20 patients with significant urethral destruction [9]. He formed a small-caliber urethra around a size 10–12 Fr Foley catheter using tissues that had retracted into the urethral roof in addition to a bulbocavernosus graft. Retropubic suspension was performed at a later date if indicated. Morgan et al. reported a favorable outcome in 8 out of 9 patients using a combined abdominovaginal approach, bulbocavernosus graft, Marlex suburethral sling and labial skin flaps [37]. In 1989, Blaivas published a series of 10 woman who had sustained total or partial loss of the urethra, with extensive tissue damage to the bladder neck and trigone [38]. He used a vaginal flap reconstruction technique in addition to a labial fibroadipose graft. Five of these patients underwent a concomitant pubovaginal sling procedure, 3 had a modified Pereyra operation and 1 had a modified Kelly suburethral plication. Six of the 10 patients were totally continent after a single operation, which included an anti-stress incontinence procedure. Three patients had type 3 stress incontinence postoperatively and 1 was found to have a vesicovaginal fistula just proximal to the neourethra. Of the women with stress incontinence, 2 had undergone a modified Pereyra operation and 1 had undergone a pubovaginal sling. Of the 4 patients with postoperative incontinence, 2 were subsequently cured by a pubovaginal sling and one by transvaginal fistula repair.

Bladder Flaps

The principles of bladder flap surgery were introduced by Boari in 1894 in his classic description of ureteral reimplantation [39]. In 1929, Rosenstein used a tubularized flap of bladder wall to construct the distal portion of a hypospadiac urethra [40]. Twenty years later Barnes and Wilson reported for the first time the complete and successful creation of a neourethra using an anterior bladder flap [41]. Using a similar technique, Ellis and Hodges recorded a partial cure in 5 and a total cure in one of 6 fistulas [42]. In addition, they used a rectus abdominis muscle graft as a platform for their neourethral construction.

In 1959 Tsuji et al. developed a two-stage bladder flap operation [43]. At the first operation a strip of anterior bladder wall was elevated; the strip was left attached at both ends to the bladder and the bladder wall was then closed beneath the strip. Over a period of 5 weeks the strip spontaneously assumed a tubular shape. At a second operation the tube was detached from the bladder at one or other end and used for bridging urethral or ureteral defects.

In histological studies of the bladder Tanagho et al. discovered a concentration of circular smooth muscle fibers in the anterior wall just above the internal urethral meatus [44,45]. The authors postulated that a muscular tube constructed from this portion of the bladder would possess an effective sphincteric activity. Using a canine model, they first performed a radical prostatectomy. They then developed a bladder flap with

its base in the proximal anterior bladder wall; this was finally tubularized to form a neourethra and anastamosed to the distal urethra [45]. This operation was performed in 10 dogs; of the 7 that survived the immediate postoperative period, 6 were totally continent. Histologic examination of the neosphincter confirmed it to be very similar to composition and archtecture to the original sphincter. Over a 10-year period, Tanagho reported an excellent outcome in 23 and a good outcome in 17 of 56 patients using this technique [46].

Using a modification of this anterior bladder flap operation, Koraitin reported a good result in 5 and a satisfactory result in 1 out of a total of 7 women; Bissada and McDonald achieved continence in 2 out of 4 patients with giant urethrovesicovaginal fistulas, and Hanash and Sieck successfully closed a 4 × 7 cm circumferential fistula associated with loss of two-thirds of the urethra [47–49]. Elkins et al. have recently reported the use of a modified Tanagho procedure performed transvaginally for obstetrically related fistulas in West Africa [50]. Eighteen out of 20 fistulas were successfully repaired using this technique, follow-up time being at least 1 year. A fibroadipose labial graft was placed over the site of fistula repair in all cases. Those with optimal continence also had an adjunctive anti-stress incontinence procedure at the time of initial surgery or at a second operation, using either a bladder-neck needle suspension or a pubovaginal sling.

In 1964 Leadbetter described the formation of an elongated muscular urethra from posterior bladder flaps [51]. This technique is a modification of the urethral lengthening procedures pioneered earlier by Young and Dees [52,53]. Leadbetter opened the bladder transabdominally using a midline cystotomy. The ureteral orifices were identified and the ureters were reimplanted 3–4 cm more superiorly in the bladder. Following reimplantation of the ureters, longitudinal incisions were made on each side of the urethra and bladder wall. Bilateral bladder wall flaps were then developed and tubularized to form a long neourethra, the ureteral reimplantation providing the critical extra length. Leadbetter reported on 5 patients using this technique. All were girls, aged between 3 and 12 years of age. The main causes of their incontinence were epispadias and sphincteric damage post bladder-neck bladder revision and Y-V plasty. Postoperatively 2 were completely continent, 2 had mild stress incontinence and one had marked incontinence as a result of both detrusor instability and reduced bladder capacity. Using the Leadbetter technique in 25 patients, Tanagho achieved an excellent results in 4 and a good result in 9 [46]. Both the Tanagho and the Leadbetter operations are performed for a variety of indications, e.g. epispadias, post-prostatectomy incontinence, iatrogenic sphincteric damage and genitourinary fistulas. They have not been proved, however, to be superior to the less complicated vaginal flap reconstruction techniques in the treatment of bladder-neck/proximal urethral fistulas [38].

Sliding Bladder Flaps

A new technique for vesical autoplasty has been developed by Gil-Vernet et al. [54]. A posterosuperior bladder wall flap is created so that it can slide down to cover large defects, even in small-capacity bladders. The authors have achieved a 100% closure rate at 1–2 years follow-up in all 42 cases, including 8 patients with a significantly reduced bladder capacity. All fistulas had been operated on previously at other institutions. The sphincteric mechanism was intact in all cases prior to repair.

Total Substitution of the Lower Urinary Tract and Continent Reservoirs

Mundy has described a radical technique for total substitution of the lower urinary tract, in which a pedicled labial skin tube is anastomosed to a substitution cystoplasty [55]. The neourethra is tunnelled subcutaneously in such a manner as to provide a mechanical, non-muscular continence mechanism, the patient voiding by intermittent self-catheterization. Mundy reported on 6 women having pelvic reconstructive surgery for rectovesicovaginal fisutlas after radiotherapy/radical hysterectomy for carcinoma of the cervix. Five of the 6 women were continent postoperatively.

Mannel et al. report the successful use of the ilieocecal Indiana pouch as a continent urinary reservoir in 10 women, 8 of whom underwent total pelvic exenteration for cervical cancer recurring after radiotherapy, and 2 having urinary diversion for radiation-induced vesicovaginal fistula [56]. Continence is achieved through reconfiguration of the cecum and ascending colon so as to prevent the generation of high-pressure peristaltic waves, together with imbrication of the efferent ileal segment. All achieved daytime continence, with a mean time between catheterizations of 4.5 hours and a mean pouch capacity of 500 ml. There were no significant postoperative complications. These results are superior to those of the Kock pouch in similarly irradiated patients, in whom urine leakage rates of 20%–37.5%, reoperation rates of up to 25%, and incontinence rates of between 10% and 20% have been reported [57–59].

Summary

Approximately 80% of all genitourinary fistulas are amenable to transvaginal repair [60]. Success rates of over 85% have been achieved in the repair of difficult fistulas using adjunctive labial fibroadipose grafts [6]. The majority of fistulas requiring tissue donation may therefore be effectively treated using a vaginal approach and a modified Martius graft. There is probably little or no advantage in incorporating bulbocavernosus muscle fibers in the graft. Although some concern exists regarding the long-term viability of these grafts in

radiation-induced fistulas, in view of the relatively simple operative technique, together with the low associated morbidity, modified Martius grafts may be deemed suitable for first-time repairs of such fistulas. The gracilis muscle graft should be considered next in cases of exclusive transvaginal repair. Great care must be taken to ensure that the dominant blood supply is provided by the proximal pedicle; greater use of intraoperative Doppler ultrasound (where available) may prove helpful in this regard. The omental graft is undoubtedly the most versatile; it can be used in both abdominal and combined abdominovaginal procedures; it also provides an excellent blood supply to contiguous structures and functions as an effective biological pelvic drain. The recently described posterosuperior sliding bladder flaps deserve further evaluation.

The management of bladder-neck/proximal urethral fistulas remains the single greatest challenge in fistula surgery today. The majority of these fistulas occur in the third world and are obstetrically related; prevention is a key issue. It is increasingly recognized that this type of fistula, together with other complex types occurring in this context, should be referred to special fistula centers [53]. For most fistulas involving the sphincteric mechanism, there is no clear advantage in bladder flap reconstruction over vaginal flap reconstruction, the latter being augmented by an anti-stress incontinence procedure where appropriate [61]. In cases with gross tissue destruction, however, the modified transvaginal Tanagho procedure, as described by Elkins et al., with adjunctive labial grafting plus bladder-neck needle or sling suspension, would appear to give optimal results. When continent urinary diversion is required, the Indiana pouch appears preferable to the Kock pouch; ureterosigmoidostomy is, however, technically and culturally more appropriate in these circumstances in the developing world.

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Review of Current Literature

Urovaginal Fistulas: Experience With the Management of 41 Cases

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Over a 20-year interval from 1971 to 1990, 41 patients with urovaginal fistulas were treated. Thirty-four had vesicovaginal, 2 had urethrovaginal, 3 had ureterovaginal, 1 had ureterovesicovaginal, and 1 had an ileovesicorectovaginal fistula. The causes were hysterectomy for myomata in 26, radical hysterectomy for carcinoma of the cervix in 9, childbearing in 2, vaginal reconstruction in 2, and vaginal foreign body in 2. Diagnosis was made by vaginal examination, cystoscopy and excretory urography. The location, size, number and relation of the fistulas to ureteric orifices were determined. Transvaginal repair was used in 28 patients, transvesical in 6, and other combinations of surgeries in the remaining patients. In the vaginal approach the fistula was circumscribed and scar tissue excised. The vaginal wall was incised 1–2 cm at both ends of the fistula, separated from the bladder wall, and the bladder and vaginal walls were closed separately. The bladder was drained for 14 days. Urovaginal fistulas were successfully closed in 35 of 37 patients at the first attempt.

Comment

The authors comment that the vaginal approach was not suitable in patients with ureteral orifices at the edge of the fistula, large fistulas after radical hysterectomy and radiation therapy, multiple fistulas, or a narrow vagina which limited access to the fistula site. In most industrialized nations, most fistulas will either follow abdominal hysterectomy for benign disease, radical hysterectomy or radiation therapy. The fistulas occurring after surgery for benign disease are most easily repaired by a vaginal approach, and many centers use a Latzko technique. This involves identification and access to the fistula site at the top of the vaginal cuff, followed by removal of vaginal epithelium within 1.5 cm of the fistula, and then a triple-layer closure with 3/0 polyglycolic sutures to invert the remaining vaginal and subvaginal tissues into the bladder at the fistula site and close the vaginal epithelium. The essential components to successful repair of fistulas are proper diagnosis and identification of the extent of the problem, and good surgical technique, whatever the approach. The tissues must be closed without tension.