

Megameatus intact prepuce variety of hypospadias: tips for repair using the modified glanular approximation procedure

Akram M. Elbatarny, Sherif M. Shehata and Khaled A. Ismail

Background/purpose Megameatus and intact prepuce (MIP) is an unusual, anterior hypospadias variant. Cosmetic remodeling is usually carried out to avoid disturbing the child's psychological state. Several approaches are used for MIP repair. The purpose of this study was to present a single institution's experience with the modified glanular approximation procedure (GAP) in the treatment of the MIP variant of hypospadias and the tips needed to obtain the best outcome.

Patients and methods Seventeen patients with MIP were repaired between May 2004 and May 2009 by the modified GAP technique. The technique was used to achieve a conical glans with a vertical slit, tip-cited meatus, and a straight urine stream. Patient/parent satisfaction was assessed by a subjective score that ranged between 0 and 3 and complications were reported.

Results All patients were repaired using the modified GAP technique. The age of the patients ranged from 6 months to 28 years. Four patients were circumcised with a history of intact prepuce. An intermediate layer was added in seven patients. Excision of a part of the redundant urethral plate

was carried out in six cases. Disruption of the repair occurred in one patient as a result of wound infection. Excellent cosmetic results were achieved in 14 patients (10 with a subjective score of 3 and four with a subjective score of 2). Two patients expressed an acceptable score of 1 and one patient was dissatisfied with a subjective score of 0.

Conclusion Good cosmetic results, such as achievement of a straight urine stream and patient satisfaction, can be achieved using the modified GAP procedure. The steps should be tailored to individual cases. *Ann Pediatr Surg* 7:82–87 © 2011 Annals of Pediatric Surgery

Annals of Pediatric Surgery 2011, 7:82–87

Keywords: hypospadias, megameatus, modified glanular approximation procedure

Pediatric Surgical Unit, Tanta University Hospital, Egypt

Correspondence to Akram M. Elbatarny, MD, Pediatric Surgical Unit, Tanta University Hospital, 31111, Egypt
Tel: +20 16 51 46 222; fax: +20 40 34 164 27;
e-mail: akrammohb@hotmail.com

Received 27 February 2011 Accepted 15 March 2011

Introduction

Megameatus and intact prepuce (MIP) is an unusual, anterior hypospadias variant characterized by a widely splayed coronal or subcoronal meatus, a deep glanular groove, a normally conformed prepuce, and no cordee [1,2]. It has no effect on micturition or sexual physiology. Cosmetic remodeling is usually carried out to avoid disturbing the child's psychological state [3–5]. Several approaches are used for MIP repair, including the glanular approximation procedure (GAP), the pyramid procedure, cutaneous advancement procedure, and the subcutaneous frenulum flap with many modifications [2,6–12]. The MIP variant represents one of the most technically challenging types of hypospadias to repair and to achieve cosmetically satisfying results [2,6]. The modified GAP is easy, simple, and gives excellent results. The purpose of this study was to present our experience as a single institution's experience with the modified GAP in the treatment of the MIP variant of hypospadias and the tips needed to obtain the best outcome.

Patients and methods

Seventeen patients with MIP were repaired between May 2004 and 2009 using the modified GAP technique. The cases included uncircumcised and circumcised children. We used Loupe × 2.5 magnification. The technique used was tailored to individual cases. The operation was commenced using the classical GAP technique [6]

with a U-shaped incision around the megameatus and urethral plate. This was followed by a wide dissection of the glanular wings (Fig. 1). This allowed an evaluation of the urethral plate and fashioning of the neourethra with the same diameter as the proximal urethra, which entailed excision of excess redundant urethral plate tissues when necessary (Fig. 2a and b). Degloving of penile skin was carried out for a distance of approximately 1 cm; this allowed for freeing the meatus for a tension-free urethroplasty and also allowed harvesting the intermediate layer, if intended to be taken from this site. Urethroplasty was accomplished with 6/0 Polydioxanone or Vicryl subcuticular continuous sutures. Next we evaluated, on the basis of the size of the glans and glanular wings, whether an intermediate layer could be interposed without undue tension on the closure of glanular wings (Fig. 3a and b). The intermediate layer was harvested as a preputial deepithelialized island flap in uncircumcised boys (Fig. 4a). In circumcised boys, it was taken from nearby dartos fascia, Buck's fascia (Fig. 4b), or from a deepithelialized perimeatal tissue flap. The intermediate layer was fixed with interrupted 6/0 Vicryl sutures. This was followed by a two-layer glanuloplasty (5/0 Vicryl). Finally, we trimmed the excess skin, completed circumcision in uncircumcised patients, and closed the penile skin. The final appearance of a conical glans with an appropriately sized, vertically slit, tip-cited meatus was reevaluated. A 6 F Nelaton dripping stent was

selectively used and removed after 3 days (Fig. 5a and b). The urinary stream was evaluated 2 weeks postoperatively after subsidence of the glanular edema. Patient/parent satisfaction was assessed by a subjective score in a range between 0 and 3, in which 3 = excellent satisfaction, 2 = moderate satisfaction, 1 = mild satisfaction, and 0 = no satisfaction, at 6 months postoperatively. The mean follow-up period was 8 months and 17 days (range: 6–9 months).

Fig. 1



Deep dissection of glanular wings.

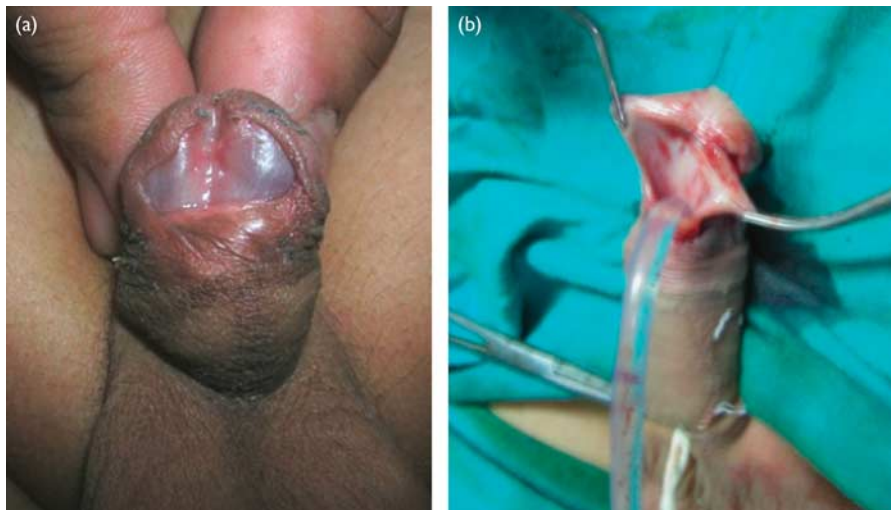
Results

A total of 17 patients with MIP were treated over a 5-year period. Their age ranged from 6 months to 28 years. There was only one adult patient, who was 28 years old, whereas the age in the remaining 16 patients ranged from 6 months to 5 years. Four patients were circumcised with a history of intact prepuce. The main reasons cited for presenting for treatment were accidental discovery during examination for other purposes, referral from pediatricians and general surgeons who refused to circumcise these children as they were unsatisfied with the appearance of the meatus, an abnormal urinary stream, psychogenic upset, and parental dissatisfaction with the appearance of the meatus. The adult patient complained of splaying of urine and psychogenic upset; he was anxious about the shape of his glans. He also attributed some functional sexual troubles to this condition.

All patients were repaired using the modified GAP technique. An intermediate layer was added in seven patients. It was harvested from the preputial deepithelialized island flap in four patients, from the deepithelialized perimeatal tissue flap in one patient, from the dartos fascia flap in one patient, and from the Buck's fascia flap in one patient; the last three patients were circumcised. Excision of a part of the redundant urethra was carried out in six cases. A dripping stent was used in 11 patients.

Mild distal penile edema occurred in six patients and resolved spontaneously within 48 h. Disruption of the repair occurred in one patient as a result of severe wound infection. Excellent cosmetic results were achieved in 14 patients (Fig. 6), 10 with a subjective score of 3 and four with a subjective score of 2. Two patients gave an acceptable score of 1. One patient was dissatisfied with a subjective score of 0; this patient suffered complete wound disruption. The main causes of dissatisfaction were wound infection/disruption, an imperfect urinary stream, and unsatisfactory glanular appearance.

Fig. 2



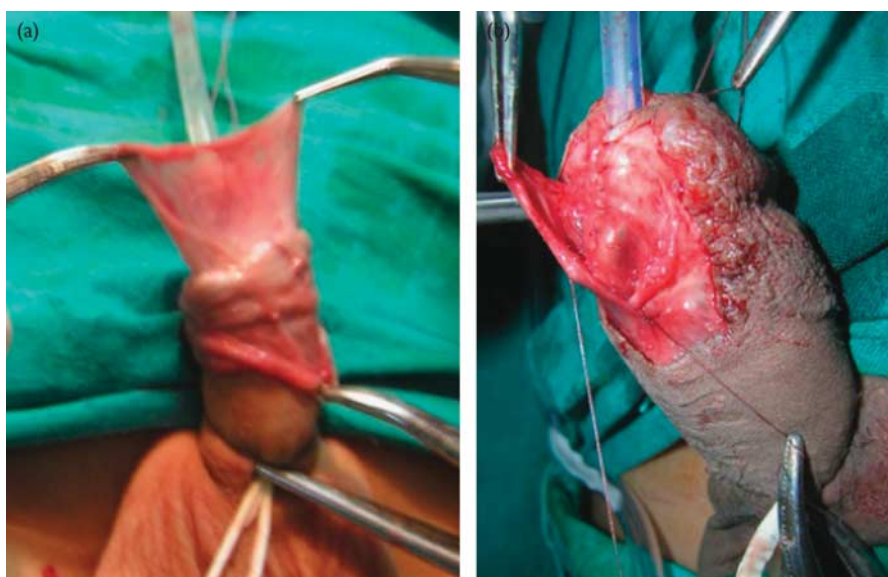
(a) A very wide urethral plate that required trimming. (b) Excess urethral plate to be trimmed.

Fig. 3



(a) Small-sized glans; an intermediate layer is difficult to interpose. (b) Bulky glans can accommodate an intermediate layer.

Fig. 4



An intermediate layer. (a) Deepithelialized preputial flap. (b) Buck's fascia.

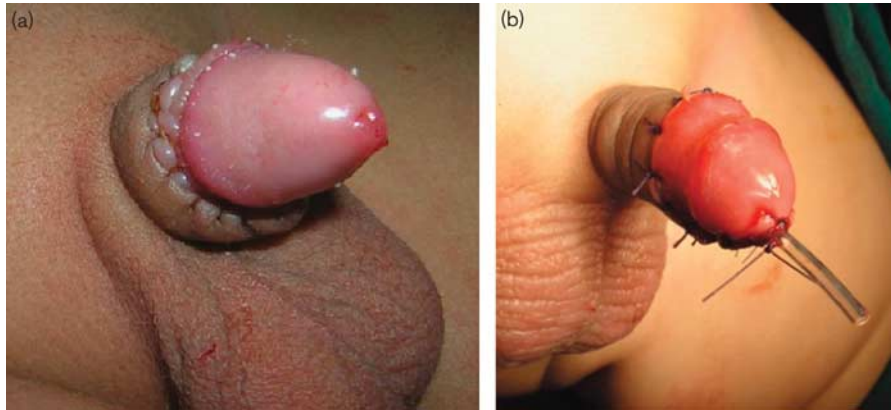
Discussion

The distinct anatomic features of MIP have led to the emergence of several techniques specifically intended to achieve good cosmetic and functional results that were not achievable with standard techniques for hypospadias repair (e.g. perimeatal-based flaps and meatal advancement and glanuloplasty [7]). The suboptimal results of the perimeatal-based flap and the meatal advancement and glanuloplasty techniques, which are suitable for nonmegameatal hypospadias, have led to the development of techniques specific to the MIP variant [2,13]. As most of the patients are circumcised, the penile skin is usually thin and scarred. The dissection of the wide meatus and urethral plate may result in thin glanular wings that are more prone to dehiscence and urethral fistula formation [9,13].

The reported incidence of MIP in the literature is variable, being approximately 3–6% of hypospadias cases [2,4,13]. Being an unusual variant, the range of published case series of MIP is between 8 and 37 cases and the duration of these studies is 3–20 years [2,7,13,14]. We had 17 cases in a 5-year period, which is within the range of published case series.

Achievement of a perfect esthetic penile appearance for this anomaly is crucial; the treatment is mainly cosmetic remodeling and not a functional one. The trend for total penile perfection with the neomeatus being situated at the tip of the penis has been raised since 1987. The GAP was presented as a simple solution to repair coronal or glanular hypospadias in patients specifically with a wide and deep

Fig. 5



(a) Immediate postoperative non-stented. (b) Immediate postoperative stented.

Fig. 6



Six months after surgery.

glanular groove and a noncompliant or fish-mouth meatus. The GAP represents a simplified version of the Thiersch-Duplay method without the necessity of creating large flaps [5,6]. Zaontz, who described the original GAP technique, mentioned that minor modifications have been used over the years; namely, a double-running 7.0 polyglycolic acid suture and, on occasion, a third layer of interrupted lambert sutures [10].

As is the case with other hypospadias variants, no single type of repair is optimal for all circumstances [10,13]. MIP is not a uniform variant, but rather a spectrum of

different combinations of its various characteristics [13]. Modifications to GAP can make it suitable for these various anatomic characteristics.

Deep dissection of glanular wings allows for evaluation of the width of the urethral plate and fashioning of the neourethra to a diameter that matches the proximal urethra. This is achieved by excising excess urethral tissue, when needed. Dissection of the glanular wings will also allow for performing a tension-free urethroplasty. Fashioning the neourethra without dissection, as in the original GAP technique, will create a neourethra with different diameters depending on the depth of the glanular cleft, which might not match the original urethral diameter. The difference in caliber could, in theory, lead to pressure differentials that predispose to fistula formation [11,13]. Gittes *et al.* [7], on revisiting the GAP technique, performed subcutaneous mobilization of glans tissue to facilitate glanular closure. This deep glanular dissection and urethral tailoring have also been used in other techniques for MIP repair, including the pyramid procedure and its modification [2,9]. This dissection, however, should be performed meticulously and cautiously in variants of MIP with small glans and deep urethral cleft to avoid injuring a thin glanular flap.

The original GAP procedure does not interpose an intermediate layer and includes two overlying suture lines. An editorial comment on GAP criticized the inherent risk involved in the technique of fistulas due to overlying suture lines [6,13]. Zaontz [6], however, described this risk as being theoretical and stated that he did not encounter it in his practice. Interposed flaps of vascular tissue can be advantageous in all types of hypospadias repair [8]. Local flaps of subcutaneous tissue have been used not only for hypospadias repair [15] but also extensively for the repair of hypospadias fistulas [16]. The value of an intermediate layer is now known to decrease the fistula rate [13,17]. We used an intermediate layer in seven patients. This layer can be harvested from a preputial deepithelialized island flap in uncircumcised boys and from dartos fascia, Bucks fascia, or deepithelialized perimeatal-based flap in circumcised boys.

We observed no fistula in patients with or without an intermediate layer but the number of patients is too small for a statistical comparison. Disruption of repair that occurred in one patient, without an intermediate layer in the repair, resulted from severe deep infection and could probably have also happened in the presence of an intermediate layer. Many reports on the use of this modification in the GAP repair have been published. Kogan states that, in his experience, although fistulas were uncommon previously without an interposing layer, they should be exceedingly rare with this modification. Docimo [8] introduced a subcutaneous frenulum flap as an interposing layer. Hill *et al.* [9] modified the Pyramid procedure for MIP repair by the addition of a deepithelialized perimeatal tissue flap to cover the ventral suture line. However, we omit this step if we feel the glans is small and will be closed under tension and will narrow the urethral lumen; however, we close the glans in two layers exclusively in all our cases.

A large number of children with MIP have been circumcised because of the apparently normal appearance of the prepuce [2,7–9,12]. Parents may believe that the defect was inadvertently caused by circumcision [18]. Although some researchers stated that circumcision limits the surgical options and presents an additional difficulty [7,12], other researchers think that retention of the foreskin is not a factor in the repair of the MIP variant [2,19,20]. However, the solid recommendation is that when an MIP is discovered during circumcision, the planned circumcision should be abandoned, the child returned to the ward, and the findings discussed with the parents [21–23]. Thus, physicians who perform circumcision should fully retract the prepuce to detect occult hypospadias before completing the procedure [24]. We had four circumcised patients. These four patients were reassured and were not advised surgical repair. Six out of 13 patients who were not circumcised went on for a circumcision; however, the procedure was abandoned after retraction of the foreskin. In three patients the surgeon considered it as a hypospadias, and in the other three cases researchers were uncertain about the meatus and abandoned the procedure for further consultation in consideration of the safety of the children. This means that many researchers are still unaware of this condition.

Fourteen patients (82.4%) in our series had an excellent cosmetic outcome. Two patients had a good cosmetic appearance, and the result in one patient was acceptable. Zaontz [6] showed excellent cosmetic results in 23 of 24 patients (95.8%) and Gittes *et al.* [7] described excellent cosmetic results on using GAP in 37 patients. Our classification of results according to subjective patient/parent satisfaction and the small number of patients treated might explain the difference in the results. We had one complete disruption from severe wound infection. This patient underwent a successful redo Mathieu repair 8 months later. This corresponds to the very low complication rate mentioned in other published series.

The use of stents with GAP is a variable issue. The original GAP technique did not use any stents. The

advantage of this technique was that the repair could be carried out as an outpatient procedure, thus averting the anxiety of parents with regard to manipulation of stents or catheters [6]. A stent may exert tension on the suture line and result in fistula formation [12]. Gittes *et al.* [7] used a dripping stent with GAP in 35 of 37 patients. He reported localized cellulitis in one of the two patients who did not receive a stent, and concluded that drip stent may reduce the incidence of complications (fistulae, diverticula, or balanitis/distal urethritis). We used stents in 11 patients, which were removed after 3 days. Stents were used in circumcised cases, in cases with thin glanular wings, cases with small glans size, and as surgeon's preference. The patient complicated by wound disruption was stented, which means that in the face of this severe infection, which destroys the tissue, stents are not useful.

As with all hypospadias variants, MIP variants need a dynamic approach and a procedure tailored to suit the anatomic characteristics of each variant, which can be used for each patient on an individual basis.

Conclusion

MIP is a simple but challenging variant of hypospadias. The modified GAP technique could achieve good cosmetic results, with a conical glans, vertically slit, proper-sized meatus, straight urine stream, and patient satisfaction, as shown in this series of treated patients. The steps should be tailored to individual cases. More cases are needed to validate the results at a statistical level.

References

- 1 Attalla MF. Subcoronal hypospadias with complete prepuce: a distinct entity and new procedure for repair. *Br J Plast Surg* 1991; **44**:122–125.
- 2 Duckett JW, Keating MA. Technical challenge of the megameatus intact prepuce hypospadias variant: the pyramid procedure. *J Urol* 1989; **141**:1407–1409.
- 3 Mureau MA, Slijper FM, Nijman RJ, Van der Meulen JC, Verhulst FC, Slob AK. Psychosexual adjustment of children and adolescents after different types of hypospadias surgery: a norm-related study. *J Urol* 1995; **154**:1902–1907.
- 4 Sanal M, Karadag E, Konca Y, Kocabasoglu U. Megameatus and intact prepuce (MIP) associated with meatal web: a case report. *Acta Chir Austriaca* 2000; **32**:35–36.
- 5 Zaontz MR, Dean GE. Glandular hypospadias repair. *Urol Clin North Am* 2002; **29**:291–298.
- 6 Zaontz MR. The GAP (glans approximation procedure) for glanular/coronal hypospadias. *J Urol* 1989; **141**:359–361.
- 7 Gittes GK, Snyder CL, Murphy JP. Glans approximation procedure urethroplasty for the wide, deep meatus. *Urology* 1998; **52**:499–500.
- 8 Docimo SG. Subcutaneous frenulum flap (SCUFF) for iatrogenic or primary megameatus and reoperative hypospadias repair. *Urology* 2001; **58**:271–273.
- 9 Hill GA, Wacksman J, Lewis AG, Sheldon CA. The modified pyramid hypospadias procedure: repair of megameatus and deep glanular groove variants. *J Urol* 1993; **150**:1208–1211.
- 10 Hinman F, Baskin LS. Glans approximation procedure. In: Hinman F, Baskin LS, editors. *Hinman's atlas of pediatric urologic surgery*. 2nd ed. Philadelphia: Saunders, Elsevier; 2008. pp. 698–699.
- 11 Hinman F, Baskin LS. Pyramid procedure for repair of the megameatus intact prepuce hypospadias variant. In: Hinman F, Baskin LS, editors. *Hinman's atlas of pediatric urologic surgery*. 2nd ed. Philadelphia: Saunders, Elsevier; 2008. pp. 700–703.
- 12 Azmy AF. Megameatus intact prepuce variant. In: Azmy AF, Hadidi AT, editors. *Hypospadias surgery: an illustrated guide*. New York: Springer; 2004. pp. 135–138.
- 13 Bar Yosef Y, Binyamini J, Mullerand M, Matzkin H, Ben Chaim J. Megameatus intact prepuce hypospadias variant: application of tubularized incised plate urethroplasty. *Urology* 2005; **66**:861–864. discussion 864.

- 14 Nonomura K, Kakizaki H, Shimoda N, Koyama T, Murakumo M, Koyanagi T. Surgical repair of anterior hypospadias with fish-mouth meatus and intact prepuce based on anatomical characteristics. *Eur Urol* 1998; **34**:368–371.
- 15 Ross JH, Kay R. Use of a deepithelialized local skin flap in hypospadias repairs accomplished by tubularization of the incised urethral plate. *Urology* 1997; **50**:110–112.
- 16 Dennis MA, Walker RD III. The repair of urethral fistulas occurring after hypospadias repair. *J Urol* 1982; **128**:1004–1005.
- 17 Yachia D. Hypospadias. In: Yachia D, editor. *Text atlas of penile surgery*. United Kingdom: Informa Healthcare; 2007. pp. 83–106.
- 18 Peretz D, Westreich M. Pseudo-iatrogenic hypospadias: the megameatus intact-prepuce hypospadias variant. *Plast Reconstr Surg* 2003; **111**:1182–1185.
- 19 Pieretti RV, Pieretti A, Pieretti Vanmarcke R. Circumcised hypospadias. *Pediatr Surg Int* 2009; **25**:53–55.
- 20 Snodgrass WT, Khavari R. Prior circumcision does not complicate repair of hypospadias with an intact prepuce. *J Urol* 2006; **176**:296–298.
- 21 Thompson HC, King LR, Knox E, Korones SB. Report of the ad hoc task force on circumcision. *Pediatrics* 1975; **56**:610–611.
- 22 American Academy of Pediatrics. Report of the task force on circumcision. *Pediatrics* 1989; **84**:388–391.
- 23 Wilcox DT, Mouriquand P. Hypospadias. In: Thomas D, Duffy PG, Rickwood A, editors. *Essentials of pediatric urology*. United Kingdom: Informa Healthcare; 2002. pp. 213–231.
- 24 Hatch DA, Maizels M, Zaontz MR, Firlit CF. Hypospadias hidden by a complete prepuce. *Surg Gynecol Obstet* 1989; **169**:233–234.