

Results of tubularized urethral plate urethroplasty in Megameatus Intact Prepuce

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ABSTRACT

Objective: The megameatus variant of anterior hypospadias with an intact complete foreskin occurs in approximately 1%–3% of hypospadias. Hence, the objective of the study was to evaluate the results of tubularized urethral plate urethroplasty (TUPU) in megameatus intact prepuce (MIP).

Materials and Methods: A retrospective study (June 1996–June 2015) of MIP from our hypospadias registry was conducted. All patients with megameatus, either with an intact prepuce or with one previously removed, were included in the study. Case sheets of clinical records, investigations, clinical photographs, and videos were reviewed. Patients were classified into, glanular, coronal, subcoronal, and distal penile. TUPU were done. Patients were called for follow-up at 1, 3, 6, and 12 months postoperatively, and then yearly for the assessment of the cosmetic appearance and fistula, meatal stenosis, or other complications.

Results: Of 1026 patients with hypospadias, we identified 13 cases of megameatus variant of hypospadias; three of the 13 had been circumcized previously. Glanular approximation was done for the one patients of the glanular variant, and another had frenuloplasty. These two patients were excluded from the study. Incision in the inner preputial skin was closed in 10 patients to have an intact prepuce. Follow-up period varied from 6 months to 4 years (median follow-up 2½ years). None of the patients developed complications such as fistula, meatal stenosis, and/or wound dehiscence.

Conclusions: Surgical correction of MIP in the era of increased cosmetic awareness is justified. Excellent results are obtained with TUPU and along with spongioplasty and frenuloplasty because of availability of wide urethral plate and well-developed spongiosum in these patients. TUPU should be the preferred procedure in cases of MIP.

INTRODUCTION

Mega-meatus intact prepuce (MIP) is a unique anatomical variant of hypospadias. It is characterized by a deep glanular groove, a large meatus and an intact prepuce that completely covers the glans.

MIP is not a uniform variant, but rather a spectrum of different combinations of its various characteristics. It is an unusual, anterior hypospadias variant contributes approximately 3%–6% of total hypospadias cases.^[1-4]

The controversies still continues on whether to operate these patients or not.^[5] Duckett and Keating^[1] were among the first to recognize the distinct surgical challenges presented by the MIP variant. Dissatisfied with the results of the meatal advancement and glanuloplasty (MAGPI) and perimeatal-based flap procedure, they described the “pyramid procedure.” Yet another technique designed to overcome the challenges of a wide, deep glanular groove and a noncompliant fish mouth procedure is the glans approximation procedure (GAP).^[6]

The distinct anatomic features of MIP have led to the emergence of several techniques specifically intended to

Access this article online	
Quick Response Code:	Website: www.indianjurol.com
	DOI: 10.4103/iju.IJU_361_16

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Received: 25.10.2016, **Accepted:** 16.05.2017

Financial support and sponsorship: Nil

Conflicts of interest: There are no conflicts of interest.

achieve good cosmetic and functional results that were not achievable with standard technique for hypospadias repair (e.g. perimeatal-based flaps and MAGPI).^[7]

Fashioning the neourethra without dissection of glanular flaps (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 and the difference in caliber may lead to pressure differentials that predispose to fistula formation.^[3] In the original GAP procedure, an intermediate tissue interpose layer is not used, so two suture lines are overlying which again increase the chances of fistula.

The tubularized incised plate urethroplasty (TIPU) technique has achieved wide acceptance in the repair of distal hypospadias because of excellent cosmetic and functional results. This led to the application of TIPU in the repair of MIP variant^[3] but a wide urethral plate in MIP does not require incision. Furthermore, the addition of interposing dorsal dartos in TIPU might lead to dehiscence of glans and the prepuce is sacrificed during the procedure. Hence, to optimize the results, we have applied the tubularized urethral plate urethroplasty (TUPU) technique of Thiersch-Duplay with few modifications to overcome its shortcomings.

MATERIALS AND METHODS

A retrospective study was undertaken identifying MIP variants among cases of primary hypospadias operated from June 1996 to July June 2015. During this period, we had 1026 cases of hypospadias and 13 cases were of concealed hypospadias. All case sheets and photographs were evaluated for site and size of the meatus, shape of glans, status of frenulum and prepuce. They were divided into glanular, coronal, subcoronal, and distal penile according to the location of meatus [Figure 1a-d]. Surgery was done according to the need of the patients and location of meatus. Patients were followed in follow-up schedule of hypospadias 1, 3, 6, and 12 months and then yearly.

Surgical technique

A U-shape incision is given after retracting the prepuce. Base of U-encircled the meatus and only inner prepucial skin is incised [Figure 2a-c]. Urethral plate with spongiosum is mobilized and glanular flaps are raised. An excessive margin of urethral plate is trimmed if urethral plate is wide. Urethral plate is tubularized keeping the wide urethral meatus [Figure 2d]. Spongioplasty is done to cover the urethral plate, and then neourethra is covered with glanular flaps. Inner prepucial skin closure was done reconstructing the frenulum creating normal meatus and intact prepuce [Figure 2e and f]. We have done three modifications in the classical Thiersch-Duplay technique of TUPU. First, the neourethra was covered with spongiosum

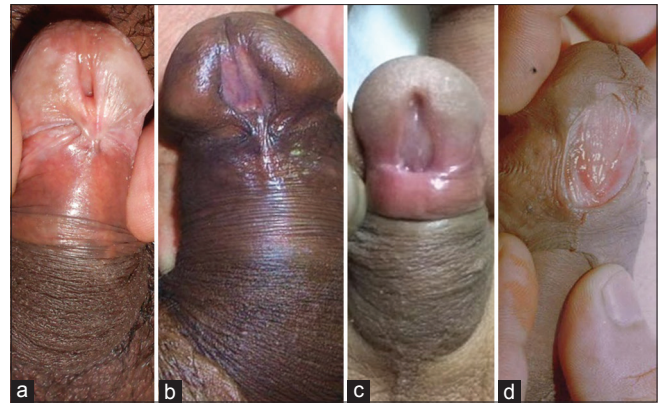


Figure 1: Types of megameatus intact prepuce. (a) Glanular. (b) Coronal. (c) Subcoronal. (d) Distal penile

in place of dorsal dartos flap, the second, prepuce was preserved and third the frenuloplasty was done to create a normal appearing penis.

RESULTS

The age of patients varied from 5 to 24 years (average 17.6 years). Three of the patients were had already been circumcised among the thirteen included in this study. A GAP was done in one patient of glanular MIP which was excluded from the study. Glanular, subcoronal, and distal penile hypospadias were seen in three, six, and four patients, respectively. There were double groove in the glans in all cases [Figure 1]. Tubularized urethral plate repair with spongioplasty was done in eleven patients and prepuce was preserved, and frenuloplasty was done in 10 patients. In another patient of glanular variety with a tight frenulum, only frenuloplasty was done. Postoperative results were excellent as shown in Figure 3a-c. well-formed glans and prepuce with frenulum. None of the patients developed complications such as fistula, meatal stenosis, and wound dehiscence. Follow-up period varied from 6 months to 4 years (median follow-up 2½ years).

DISCUSSION

The embryologic basis of MIP variant of hypospadias is obscure. The distal part of the urethra in males is derived from the urethral plate, which grows from the tip of the glans to meet the proximal penile urethra at the coronal sulcus. A cuff of tissue lies at the margin of the sulcus from the prepuce. Failure of fusion of the urethral plate typically results in the arrest of distal urethral and prepucial development; and the formation of a hooded prepuce leading to hypospadias. Duckett and Keating^[1] who coined the term “megameatus intact prepuce,” postulated that after normal folding of the proximal penile urethra and normal prepucial formation, a misdirected clefting of the glans proceeds down the already fused urethra creating the megameatus. According to their theory, prepucial

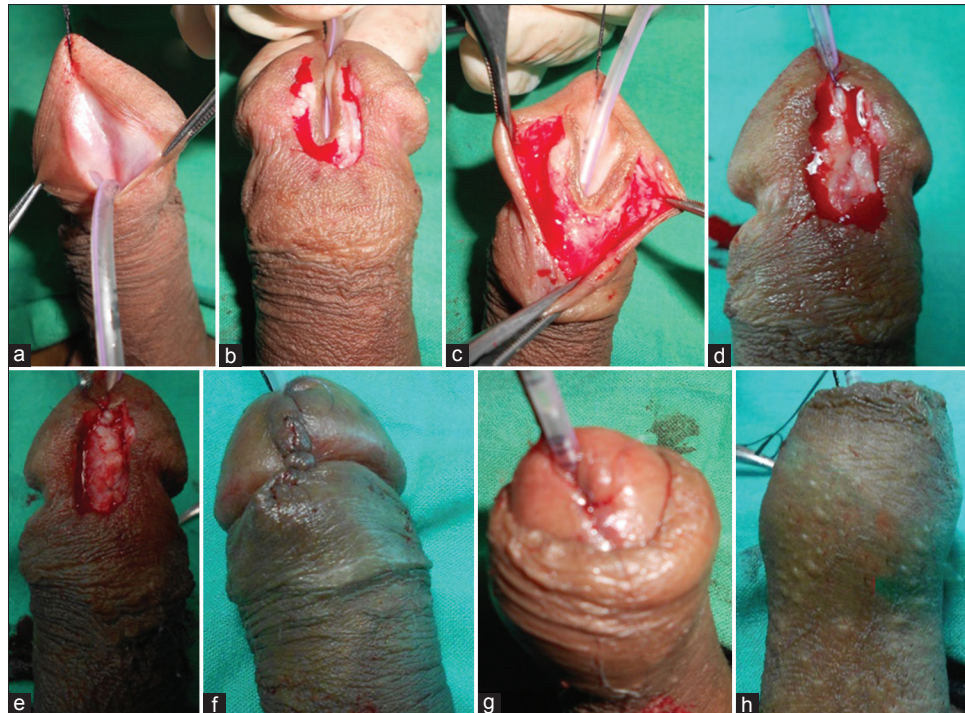


Figure 2: Steps of surgery: (a) Subcoronal megameatus intact prepuce. (b) Incision. (c) Mobilization of urethral plate and spongiosum. (d) Tubularization of urethral plate. (e) Spongioplasty. (f) Glanuloplasty and Frenuloplasty. (g) Meatus at tip of glans. (h) Well-formed prepuce



Figure 3: Postoperative results. (a) Well-formed meatus and prepuce. (b and c) Arrow showing well-formed frenulum on retraction of prepuce

development is apparently independent of that of the glanular urethra. Nonomura *et al.*^[8] proposed a deformation theory in which an ischemic or compressive change occurring after completion of a normal urethra may result in a megameatus and a normally occurring prepuce. Others feel it embryologically related to the megalourethra.^[9] However, both of these theories does not explain the embryology of megmeatus intact prepuce. If the glanular urethra forms by canalization then why urethral glanular groove is open? This shows that it is both canalization as well as the closure of glanular plate, is needed for the normal glanular urethral development rather than the canalization only. Thus,

canalization is complete, but urethral plate closure remain incomplete, and prepuce tubularization is complete that leads to megameatus intact [Figure 4]. The evidence of it lies with the existence of a double groove in all cases as shown in Figure 1 as well as figures in the published literature.^[2,5,10,11]

The incidence of MIP in our series was 1.26% which is much less than reported in the literature.^[1-4] Warren *et al.* noticed 15% incidence of MIP in consecutive 551 distal hypospadias cases.^[12] It may due to ignorance or might have gone unnoticed by the patient and the parents as religious circumcision is not practiced in all. Most of the people favor surgery.^[1-4,8,9] However, others are of the opinion that the intact prepuce plays the role of a funnel, directing urine as well as semen appropriately and lack of urinary symptoms, successful parity and in the absence of psychological stress questions the need of surgery in such patients.^[5] This observation was based on the case report only that too in a 41-year-old male. In modern hypospadiology, the excellent results of both functional, as well as cosmesis in distal hypospadias, favor surgical intervention in MIP patients.

A technique that results in favorable outcomes in non-megameatal hypospadias is not necessarily applicable to the MIP variants. The results of the perimeatal-based flap and the MAGPI techniques, which are suitable for non-megameatal distal hypospadias, are not suitable for MIP, that have led to the development of techniques specifically used for the MIP variant. The GAP is simple to perform and achieves good results when used for the glanular defects. The

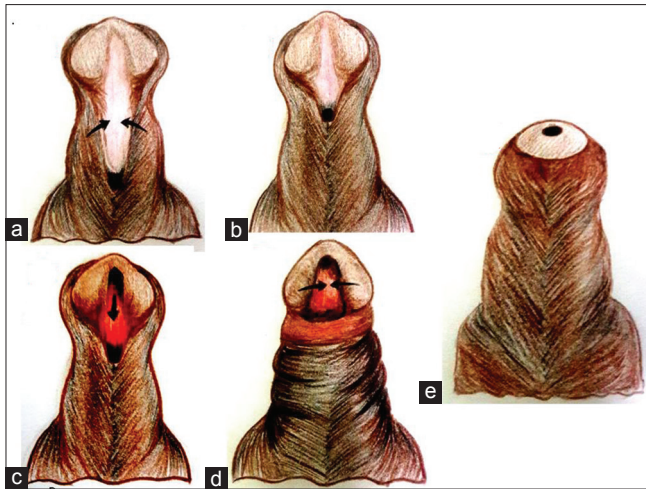


Figure 4: Developmental steps of megameatus intact prepuce. Closure of urethral fold proximal to distally. (a) Arrest of urethral fold closure along with prepuce closure ventrally to form hypospadias (splayed glans and hooded prepuce). (b) Canalization of glanular plate started and proceeds proximally. (c) Complete closure of urethral fold and prepuce. Canalization of glanular plate completed up to corona. However, there is no closure of glanular folds – Results in megameatus intact prepuce. (d and e) Closure of glanular plate results in normal development of penis and urethra

limitations of the GAP are unequal size of neo-urethra due to non-mobilization of glanular wings and superimposition of glanular suture lines without interposing tissue layer may lead to fistula, and again it is most suitable in glanular MIP only. But, those who were dissatisfied with the results of the application of other available techniques to the MIP variant, they modified GAP by adding the mobilization of glanular wings for equal size neourethra with normal urethra and tension free urethroplasty; and interposing tissue layer dorsal dartos layer to prevent fistula.^[6,10] The cutaneous advancement technique has also been used for MIP^[11] but that may not be suitable for distal penile MIP, and also the glanular defect remains uncorrected.

Another characteristic that makes MIP a surgical challenge is that most of the affected patients have been circumcised, the penile skin is usually thin and scarred, and are thus lacking prepuce and dartos tissue to be used for reconstructive procedures. However, a study by Snodgrass proved that circumcision does not affect the results of TIPU in MIP.^[13]

The anatomic characteristics of the MIP hypospadias variant present a unique challenge to surgeons. 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. The TIPU technique allows for better dissection of the glanular wings because the lateral aspects of the urethral plate are not dissected as they are with the GAP and pyramid procedure, leaving thicker glanular wings for glanular reconstruction. But the TIPU is required only when the urethral plate is narrow. Whereas in MIP, there

is wide urethral plate and hence no need of incision here. Hence, we opted for TUPU because it allows for more formal dissection of the glans wings on the expanse of the width of the urethral plate. Adding spongioplasty and frenuloplasty to TUPU restore the normal urethral and penile anatomy.

CONCLUSIONS

Surgical correction of MIP variant of hypospadias in the era of increased cosmetic awareness is justified. Excellent functional and cosmetic results are obtained with TUPU with few modifications such as spongioplasty, prepuce preservation, and frenuloplasty because of the availability of well-developed spongiosum and wide urethral plate in these patients. Therefore, it should be the preferred procedure in all cases of MIP.

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How to cite this article: Bhat A, Bhat M, Bhat A, Singh V. Results of tubularized urethral plate urethroplasty in Megameatus Intact Prepuce. *Indian J Urol* 2017;33:315-8.