Comparative Study between the Tubularized Incised Plate Urethroplasty and Single Faced Onlay Preputial Island Flap in the Management of Mid-Penile Hypospadias

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Background/Purpose: The tubularized incised plate (TIP) and the single faced Onlay preputial island flap procedures are two popular procedures used for the repair of mid-penile hypospadias deformity. This study was designed to compare these two techniques objectively.

Materials and Methods: Forty five boys with similar mid-penile hypospadias deformities were selected for this study at Cairo University Children Hospital. All were 2 years or more at the time of operation. They were assigned randomly to either a TIP (n=24) or an Onlay procedure (n=21). Operative details for each patient were recorded and the patients were followed up for a minimum of one year post operatively. Results were compared for three groups of variables: cosmetic outcome, occurrence of complications and function results which was assessed by uroflowmetry studies. Results were compiled and compared statistically.

Results: There were no differences between the two techniques as regard incidence of complications and function. On the other hand there was a significant statistical difference regarding cosmetic outcome in favor for the TIP procedure. Due to its easier technique and superior cosmetic results, the authors believe it is indicated whenever suitable urethral plate is present.

Conclusion: Both the TIP and Onlay procedures proved to be effective techniques in the management of mid penile hypospadias. However, due to a significantly better cosmetic results and easier technicality of TIP the authors believes it is indicated whenever the suitable urethral plate is available.

Index Word: Tubularized Incised Plate Urethroplasty, Hypospadias

INTRODUCTION

In 1994, a new method for hypospadias repair was described in which tabularization of the urethral plate without skin flaps was facilitated by midline plate incision. On the other hand, the single faced Onlay preputial flap repair described by Duckett, has been very popular since its introduction in 1987. This study was designed to compare objectively these two widely practiced techniques.

MATERIAL AND METHODS

Forty five boys were selected from patients presenting to the Cairo University Children Hospital, having hypospadias anomaly. All had comparable mid-penile deformities with no apparent or minimal chordee. Artificial erection test was done intraoperatively to rule out cases with severe chordee. Patients were 24 months or more at the time of operation. Parents were informed of the study’s aim, methods and written
consents were obtained. The hospital ethics committee was informed and its approval was given.

Cases were randomly assigned to undergo either a TIP urethroplasty or an onlay preputial island flap repair. Operative details for each patient were recorded. TIP procedure was done according the technique described by Snodgrass\(^1\) (Fig 1). Cases assigned to the second group underwent the onlay preputial island flap repair described by Duckett\(^2\) (Fig 2). In all patients, urinary diversion was carried out using an 8 Fr silicone stent for 5 days postoperatively. All patients were done by the same surgical team and were followed up for a minimum period of one year postoperatively; during which three groups of parameters were compared.

Cosmetic outcome was compared using the shape and the site of the neo-meatus or presence of penile rotation for reference. The shape of the meatus was objectively compared as being either vertical slit like or horizontal. Similarly, the site of the neo-meatus was classified as being situated on the tip of the glans or else where.

The incidence and type of complications as fistula, stenosis or recurrence were recorded and followed up.

Functional results were assessed using uroflowmetry. Uroflowmetry is the noninvasive determination of the characteristics of urine flow. The normal uroflow curve is plotted with the flow rate on the y-axis (ml/sec) and time on the x-axis (sec). The voided volume is the total volume of urine expelled through the urethra. The maximal flow rate (Qmax) is the maximal measured rate of flow (the peak of the flow curve), and the time to maximal flow is the time elapsed from onset of flow to maximal flow. The average flow rate (Qave) is determined by dividing the voided volume by the flow time.\(^4\) The shape of the flow tracing, can sometimes be used to make a

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presumptive diagnosis. The normal flow pattern is a continuous, bell-shaped, smooth curve with a rapidly increasing flow rate. The test was done 6 and 12 months postoperatively to patients with intact repair after exclusion of cases complicated by fistula or disruption. The Qmax was considered normal if they were above 15 ml/sec, equivocally obstructed if between 10 - 15 ml/sec and obstructed if they were <10 ml/sec. An intermittent flow pattern is one that has one or several episodes of flow and is commonly secondary to abdominal straining. The typical obstructed flow pattern has a plateau curve with a prolonged flow time, sustained low flow rate, and increased time to Qmax.5

RESULTS

Forty five patients were studied and completed the minimum 12 months follow up period. Their ages ranged between 24 and 48 months at time of operation with mean of 32 months. Three groups of variables were recorded and compared.

Natural looking slit like meatus was achieved in 79% cases in the TIP group (19/24), versus 33% in the Onlay technique (7/21) and the rest of cases had rounded shaped meatus. The difference was statistically significant in favor of TIP group. The site of the meatus was at the tip of the glans in 83% of cases in the TIP group and 76% in the Onlay groups with no statistical difference. Conical shaped glans has been achieved in 79% in the TIP and 57% in the Onlay group and this was statistically insignificant. Penile rotation was encountered in the Onlay group (2 cases), this rotation was less than 30° and did not need surgical correction. No cases were recorded in the TIP group (Table 1).

As regard the overall complications, (defined as fistula, stenosis, or recurrence) the TIP group had a total incidence of complications 21%. Meatal stenosis and fistula were the frequent complications (8% each) and only one case of complete disruption. The Onlay group had 23% overall complication rate. Fistula was the commonest complication (14%) with only one case of meatal stenosis and one case of recurrence. There was no statistical significance between both groups as regard complications (Table 2).

Uroflowmetry studies were done 6 months postoperatively for all patients. Three cases were excluded in the TIP group and 4 cases in the Onlay group due to presence of complications. In the TIP group 17 cases out of 21 (81%) had normal peak flow rate, two cases (9.5%) had equivocal flow and 2 cases (9.5%) had obstructed flow (Table 4). In the Onlay group 17 patients were studied; 13 (82%) had normal peak flow rate and 4 patients had equivocally obstructed flow rate (18%). Comparing results in both groups showed no statistical difference.

Cases with equivocal or obstructed flowmetry pattern responded to dilatation and/or meatomomy. They all revert to normal flow pattern on the follow up tests done 12 month postoperatively. Table 4

Table 1: Cosmetic results in both groups

<table>
<thead>
<tr>
<th>Cosmetic Outcome</th>
<th>TIP group (n=24)</th>
<th>Onlay group (n=21)</th>
<th>P value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slit like meatus</td>
<td>19 (79%)</td>
<td>7 (33%)</td>
<td>0.002</td>
<td>highly significant</td>
</tr>
<tr>
<td>Site at tip of the glans</td>
<td>20 (83%)</td>
<td>16 (76%)</td>
<td>0.55</td>
<td>Non significant</td>
</tr>
<tr>
<td>Conical shaped glans</td>
<td>19 (79%)</td>
<td>12 (57%)</td>
<td>0.11</td>
<td>Non significant</td>
</tr>
<tr>
<td>Penile rotation</td>
<td>0 (0%)</td>
<td>2 (9.5%)</td>
<td>0.234</td>
<td>Non significant</td>
</tr>
</tbody>
</table>

Table 2: Incidence and type of complications among both groups

<table>
<thead>
<tr>
<th></th>
<th>TIP group (n=24)</th>
<th>Onlay group (n=21)</th>
<th>P value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fistula</td>
<td>2 (8%)</td>
<td>3 (14%)</td>
<td>0.526</td>
<td>Non significant</td>
</tr>
<tr>
<td>Meatal stenosis</td>
<td>2 (8%)</td>
<td>1 (5%)</td>
<td>0.631</td>
<td>Non significant</td>
</tr>
<tr>
<td>Recurrence</td>
<td>1 (4%)</td>
<td>1 (5%)</td>
<td>0.923</td>
<td>Non significant</td>
</tr>
</tbody>
</table>
Table 3: Flowmetry results 6 months post operatively

<table>
<thead>
<tr>
<th></th>
<th>TIP group (n=21)</th>
<th>Onlay group (n=17)</th>
<th>P value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal flow</td>
<td>17 (80.95%)</td>
<td>13 (76.47%)</td>
<td>0.736</td>
<td>N.S.</td>
</tr>
<tr>
<td>Equivocal flow rate</td>
<td>2 (9.52%)</td>
<td>4 (23.53%)</td>
<td>0.239</td>
<td>N.S.</td>
</tr>
<tr>
<td>Obstructed flow</td>
<td>2 (9.52%)</td>
<td>0 (0%)</td>
<td>0.191</td>
<td>N.S.</td>
</tr>
</tbody>
</table>

Fig 3A. Obstructed curve showing prolonged voiding time and abnormal straining with Qmax 8.8ml/sec

Fig 3B. Normal bell shaped curve with borderline obstruction Qmax 13 ml/sec

Fig 3C. Normal bell shaped curve with Qmax 17ml/sec (Normal flow).
DISCUSSION

The treatment of hypospadias has been changing during the last decades in order to achieve normal functional and cosmetic appearance of the urethral meatus. Two of the widely practiced techniques are the TIP and single faced Onlay preputial island flap. In the last decade, since the urethral plate incision urethroplasty was presented by Snodgrass, it gained wide popularity due to its ease and vertically oriented appearance of the meatus.3

In this study all patients were preselected so that they would all meet the criteria for TIP procedure, namely a healthy urethral plate suitable for tabularization.3 Inclusion criteria also included cooperative toilet trained children who would be able to undergo uroflowmetry studies for functional assessment.6 None of the cases had severe chordee. Moreover artificial erection test was performed intraoperatively.2 In 6 cases there were curvature between 20-30° and dorsal plication2,7 was needed in 4 cases (2 in each group).

In recent years, one of the important considerations in hypospadias surgery is the final cosmetic result. The ultimate goal is a penis not only functionally normal but also appears to have been only circumcised.7 In this study slit-like vertical shape of the meatus and the glans could be achieved in the TIP group in the majority of cases (79%), in contrast to only 33% of cases in the Onlay group. This usually encountered horizontally oriented rounded meatus is one of the main criticism for this procedure specially when the ventral glans is flat. This difference in the shape of the meatus was statistically significant in the favor of TIP group (P value= 0.001).

On the other hand there was no statistical significant difference between both groups as regard the site of the meatus. Terminal position was achieved in 83% of cases in the TIP versus 76% of cases in the Onlay group.

Penile rotation as a postoperative complication was reported by Figueroa and Fitzpatrick8 who had moderate penile torsion in 1/63 cases of their TIP cases postoperatively. In this study 2 cases in the Onlay group had mild torsion and none of TIP group had this complication. The authors believe that the fear of injuring the vascular pedicle in the Onlay flap does not allow extensive pedicle dissection resulting in torsion. However, Van der Werff and. Ultee8 in their long term follow up for hypospadias series could not clear out whether the operations have caused worsened or diminished penile rotation.

Complications are common after hypospadias repair, ranging from fistulae to complete loss of the neourethera requiring total reconstruction.9 The incidence of complications was 21% in the TIP group (8.5% fistula, 8.5% meatal stenosis and 4% complete dehiscence). This is higher than that is reported by Sozubir and Snodgrass7 14% (fistula 9%, glandular dehiscence 4% and meatal stenosis in 1%) while Cheng10 had in his 540 cases, only 1% overall incidence of complications in his TIP series with fistula 0.6% followed by meatal stenosis 0.3%.

In this study, the Onlay group had overall 23% complication rate which is higher than that is reported by Keating and Rich,11 (15%) and Weiner12 (22%). In this work Fistula was more common in the Onlay group (14%). The same was observed by Weiner who had 17% incidence of fistula in his study. The Onlay island flap though having the versatility of widening the urethral caliber, but it carries the disadvantage of having two suture lines adding more risk for fistulae formation.12 The incidence of complication however, was statistically insignificant between the two groups.

Uroflowmetry is a non-invasive diagnostic method well accepted by children and is uninfluenced by stress.13 In this study the Qmax values were normal in the majority of cases in both groups at 6 months postoperatively (76% in the TIP versus 81% in the Onlay group). This the difference was statistically insignificant. In the Tip group 19% had equivocal and obstructed flow, where as 24 % of the Onlay group had equivocal flow on the first test. Such cases in both groups were managed by dilatation and/or meatotomy and all had normal flow on the follow up test done at 12 months postoperatively. Hammouda et al6 found that 68% of his TIP cases had normal Qmax, 6 months postoperatively while 32% had equivocal flow. The flowmetry was well tolerated by children. Garibay et al14 concluded that it is an important tool to evaluate the hypospadias surgical results and to detect asymptomatic strictures. It allows the study of natural urination and could significantly reduce the frequency of calibration and postoperative urethral dilation which is an invasive, poorly tolerated procedure.13
CONCLUSIONS

From this study it is concluded that both techniques resulted in an acceptable anterior position of the neo-meatus and had comparable complications rates. Although the uroflowmetry studies showed no functional difference between the two procedures, it was an objective, reliable and repeatable investigation in children and could replace urethral calibration for postoperative functional follow up. Though both techniques sound logic alternative for the repair for this deformity, the TIP repair is preferred by the authors as being technically easier with superior cosmetic outcome and satisfying vertical slit like meatus.

REFERENCES