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High GMS score hypospadias: Outcomes after one- and two-stage operations

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Summary

Introduction
Established criteria to assist surgeons in deciding between a one- or two-stage operation for severe hypospadias are lacking. While anatomical features may preclude some surgical options, the decision to approach severe hypospadias in a one- or two-stage fashion is generally based on individual surgeon preference. This decision has been described as a dilemma as outcomes range widely and there is lack of evidence supporting the superiority of one approach over the other.

Objectives
The aim of this study is to determine whether the GMS hypospadias score may provide some guidance in choosing the surgical approach used for correction of severe hypospadias.

Study design
GMS scores were preoperatively assigned to patients having primary surgery for hypospadias. Those patients having surgery for the most severe hypospadias were selected and formed the study cohort. The records of these patients were reviewed and pertinent data collected. Complications requiring further surgery were assessed and correlated with the GMS score and the surgical technique used for repair (one-stage vs. two-stage).

Results
Eighty-seven boys were identified with a GMS score (range 3–12) of 10 or higher. At a mean follow-up of 22 months the overall complication rate for the cohort after final planned surgery was 39%. For intended one-stage procedures ($n = 48$) an acceptable result was achieved with one surgery for 28 patients (58%), with two surgeries for 14 (29%), and with three to five surgeries for six (13%). For intended two-stage procedures ($n = 39$) an acceptable result was achieved with two surgeries for 26 patients (67%), three surgeries for eight (21%), and four surgeries for three (8%). Two other patients having two-stage surgery required seven surgeries to achieve an acceptable result. Complication rates are summarized in the Table. The complication rates for GMS 10 patients were similar (27% and 33%, $p = 0.28$) for one- and two-stage repairs, respectively. GMS 11 patients having a one-stage repair had a significantly higher complication rate (69%) than those having a two-stage repair (29%) ($p = 0.04$). GMS 12 patients had the highest complication rate with a one-stage repair (80%) compared with a complication rate of 37% when a two-stage repair was used ($p = 0.12$).

Conclusions
Guidelines to help standardize the surgical approach to severe hypospadias are needed. Staged surgery for GMS 11 and 12 patients may result in a lower complication rate but may not reduce the number of surgeries required for an acceptable result. Although further study is needed, the GMS score may be helpful for establishing such criteria.

Table Complication rates for patients with GMS 10, 11, and 12 hypospadias.

GMS score	One-stage repair $N = 48$	Two-stage repair $N = 39$	p-Value
10	8/30 (27%)	2/6 (33%)	0.28
11	9/13 (69%)	4/14 (29%)	0.04
12	4/5 (80%)	7/19 (37%)	0.12

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Introduction

Despite the large number of techniques available to repair proximal hypospadias, complication rates remain considerable [1]. While anatomical features may preclude some surgical options, the decision to approach severe hypospadias in a one- or two-stage fashion is generally based on individual surgeon preference [2]. This decision has been described as a dilemma as outcomes range widely and there is a lack of evidence supporting the superiority of one approach over the other [3,4]. Indeed at this time, even the criteria used to define "severe" hypospadias remain to be established [5].

Recently, the GMS hypospadias score was developed as a means to standardize the evaluation of the hypospadias complex [6,7]. This method grades the severity of the hypospadias complex based on the size of the glans, features of the urethral plate, position of the meatus, and the severity of chordee (Fig. 1). Unfavorable characteristics are given higher scores (1—4) and individual component scores for G, M, and S are then summed to give the total GMS score (range 3—12). These features were chosen as they have been shown to, or may, impact outcomes following repair [8,9]. Prior studies have shown that GMS scoring has high inter-rater reproducibility and that individual component and total scores correlate directly with the risk of a complication following hypospadias surgery [6,7].

In this study we assess the outcomes of a group of patients having surgery for severe hypospadias and categorize results by GMS score and the surgical approach used (one-stage vs. two-stage). We anticipate that the data may be of some help for guiding the approach to surgery for severe hypospadias.

Materials and methods

Following IRB approval, a database containing the GMS scores of patients having initial hypospadias surgery at our institution was created. This database was queried to identify those patients having surgery for the most severe hypospadias (highest quartile: GMS 10, 11, and 12) who formed the study cohort. The electronic medical records of these patients, including hospital and clinic notes, were then reviewed and pertinent data collected including GMS scores, type of repair, and the occurrence of any complications following surgery. Complications requiring further surgery were assessed and correlated with the GMS score and the surgical approach chosen (one-stage vs. two-stage). Only patients with at least 6 months follow-up from their final planned surgery were included in this analysis. Also, given the purpose of this study, only urethral complications were considered including fistula, meatal stenosis, dehiscence, and stricture.

Descriptive statistics were calculated for all variables of interest and included means and standard deviations or counts and percentages, as appropriate. Complication rates were compared among GMS score subgroups using chi-square tests. In instances where the expected number of events was small (less than five), a Fisher's exact test was used in place of the chi-square test. Statistical analyses were conducted using SAS v. 9.4 (Cary, NC, USA) and statistical significance was assessed at the 0.05 level.

Results

Of the 478 patients with complete data, 87 boys with a median age of 8 months (IQR 6—12) were identified with a GMS score of 10 or higher and at least 6 months follow-up (median 23 months, range 7—34) after final planned surgery. The one-stage techniques used included tubularized incised plate (71%), Duckett tube (18%), Thiersch—Duplay (8%), and Flip-flap (3%). All two-stage repairs were performed using Byar's flaps followed by completion urethroplasty 6—12 months later. The overall complication rate for the cohort after their final planned surgery was 39% (34/87). Complications included urethrocutaneous fistula in 18 (21%) patients, meatal stenosis in four (5%), urethral diverticulum in four (5%), and glans dehiscence in three (3%). Urethrocutaneous fistula and meatal stenosis with distal urethral stricture occurred together in five patients (6%). Preoperative testosterone was given to 15 patients (17%) and the complication rate for this group of 46% (7/15) did not differ statistically from the complication rate overall.

For intended one-stage procedures (n = 48) an acceptable result was achieved with one surgery for 28

Glans (G) Score:
1. Glans good size; healthy urethral plate, deeply grooved
2. Glans adequate size; adequate urethral plate, grooved
3. Glans small in size; urethral plate narrow, some fibrosis or flat
4. Glans very small; urethral plate indistinct, very narrow or flat
Meatus (M) Score:
1. Glanular
2. Coronal Sulcus
3. Mid or Distal Shaft
4. Proximal shaft, penoscrotal
Shaft (S) Score:
1. No chordee
2. Mild (< 30°) chordee
3. Moderate (30 - 60°) chordee
4. Severe (> 60°) chordee

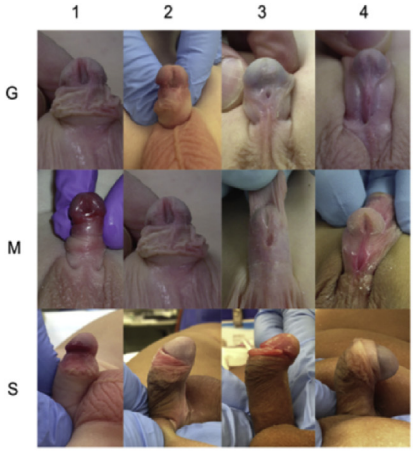

Figure 1 GMS criteria and representative photos. Note: G, M, and S scores summed to give GMS score (range 3—12).