Meta Analysis Study of Complications Following Repair of Mid Penile Hypospadias using Different Surgical Techniques

A Systematic Review/Meta-Analysis

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Dina Samir Shalaby Nashed

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INTRODUCTION

Hypospadias is one of the most common congenital defects affecting the male genitalia ***(Borer and Retik, 2007; Hinman and Baskin, 2008)***. The incidence is 1 in 250 male newborns, although its incidence seems to be increasing ***(Baskin and Ebbers, 2006; Kraft et al., 2010)***.

Hypospadias is defined as an insufficient development of the urethral fold and the ventral foreskin, with or without penile curvature. The urethral opening is located more proximally anywhere between the tip of the penis and the perineum ***(Baskin and Ebbers, 2006; Hinman and Baskin, 2008)***.

Hypospadias classification is based on the position of the meatus, within three categories: distal , mid-penile and proximal. Mid-penile hypospadias is with an urethral opening located on the mid shaft of penis ***(Kraft et al., 2010).***

More than 250 techniques are described for hypospadias correction ***(Prat et al., 2012).*** This is partly because of the wide spectrum of hypospadias presentations and partly because no single method produces full satisfactory results. Surgeons may use one of the following tissues to form the neourethra; mobilization of the urethra, skin distal to the meatus, skin proximal to the meatus, preputial skin, combined prepuce and skin proximal to the meatus, scrotal skin, dorsal penile skin or different grafts. In general, the surgeon should use the

technique that is suitable for the patient and with which he is most conversant. The best operation for hypospadias correction is the operation that brings the best results with the least complications ***(Hadidi, 2004; Christopher et al., 2011).***

Urethral fistula, meatal stenosis, neourethral stricture and wound dehiscence are the most common complications of most used techniques of hypospadias repair ***(Srivastava et al., 2011; Agrawal and Misra, 2013).*** Despite of the evolutions in operative techniques and instrumentations, still complications exist ***(Hensle et al., 2001)***. This study was designed to review the most performed techniques for mid penile hypospadias repair and the reported complications with each technique aiming to reach to the best technique with the least complications.

Aim of the Work

The aim of this study is to determine the best surgical technique with the least complications for repair of mid-penile hypospadias.

Chapter 1

EMBRYOLOGY OF MID-PENILE HYPOSPADIAS

Urethral Development

At the end of the third month of gestation the urethral folds around the urethral plate close up and fuse to form eventually the penile or the spongy urethra that ends at the glans of the penis (the tip of the penis) contributed by the surface ectoderm in its terminal part via a short ectodermal cord that grows to merge with the penile urethra during the fourth month of gestation ***(Sadler, 2015).***

A second degree of the teratogenicity of the urethral canal results during the fusion of the urethral folds. This process may cease too early or prematurely at any level of the tube, leading the external urethral meatus to open in a distal, mid or proximal position within the shaft of the penis ***(Sadler, 2015).***

The phallus or the penile shaft is mostly curved ventrally in the second and third degree of hypospadias deformity because of the existence of the fibrous tissue of the non-fused urethral plate that extends from the urethral orifice till the tip of the penis ***(Das, 2013).***

Skin Development

The skin of the penis is radically changed as a result of the disturbance in the formation of the urethra distal to the meatus. The ventral surface of the penis may not show a midline shallow depression of groove extending out from the meatus to the tip of the glans. The midline raphe on the penis may deviate to one side in associated with twisting of the penile skin ***(Horton et al., 1990).***

Prepuce Development

Failure of androgen-dependent growth of the ventral penile mesenchyme will lead to the dorsal hooded prepuce which is characteristic of hypospadias. This leaves a wedge-shaped defect in the ventral prepuce, including an absent frenulum ***(Stephens et al., 2002).***

The prepuce normally forms as a ridge of skin from the corona that grows circumferentially, fusing with the glans. Failure of fusion of the urethral folds in mid-penile hypospadias impedes this process, and a dorsal hooded prepuce results ***(John et al., 2019).***

Chapter 2

RELEVANT ANATOMY OF PENIS

The penis comprises three main components, the dorsally situated two corpora cavernosa, and the ventrally lying corpus spongiosum which encloses the urethra. These components are covered by areolar tissues which are all covered by a skin layer. The skin of the penis is thin, darkish in color, and without any fat tissue beneath it. It is loosely connected to the penile shaft, which allows for easy movement over the shaft. The distal penile skin leaves the surface of the penis at the level of the corona, and folds upon itself to form the prepuce which covers the glans. The inner surface of the prepuce approaches the character of a mucous membrane. This membrane passes backwards at the ventral part of the prepuce and creates the frenulum, a longitudinal fold attached to the urethral meatus. The underlying areolar structures beneath the penile skin are the dartos and Colles' fascia, superficial fascia of the penis, which forms a thin cylindrical sheath loosely attached to the skin. This fascia is carried forward into the prepuce. Buck's fascia is the deep fascia of the penis, whitish in color. It adheres itself to the tunica albuginea and is thick and elastic ***(Yachia, 2007).***

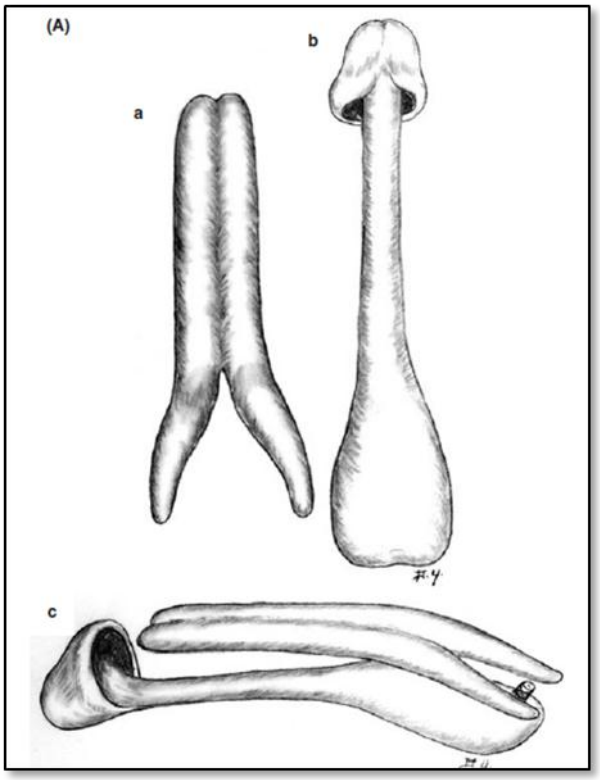

Figure (1): The three components of the penis, a. the longitudinally attached two corpora cavernosa separated proximally to form the crura; b. the glans of penisas a continuation of the corpus spongiosum (the corpus spongiosum encloses the urethra which enters the corpus through the proximally situated bulb); c. relationship between the corpora cavernosa, corpus spongiosum, and glans of penis ***(Yachia, 2007).***

Vasculature:

The prostatic urethra is supplied by the inferior vesical artery, which gives urethral branch to penetrate the prostate and the bladder neck. The bulbourethral artery supplies the membranous and bulbar urethra in antegrade fashion, whereas the pendulous urethra is supplied by the dorsal penile artery in retrograde fashion. The key feature and the reason that the

urethra can be mobilized extensively is that it has a unique dual blood supply. The corpus spongiosum thus has two blood supplies, proximally by the bulbar and circumflex cavernosal arteries, and distally by perforations of the dorsal penile artery in a retrograde fashion. In general, venous drainage mirrors the arterial supply ***(Brooks, 2007).***

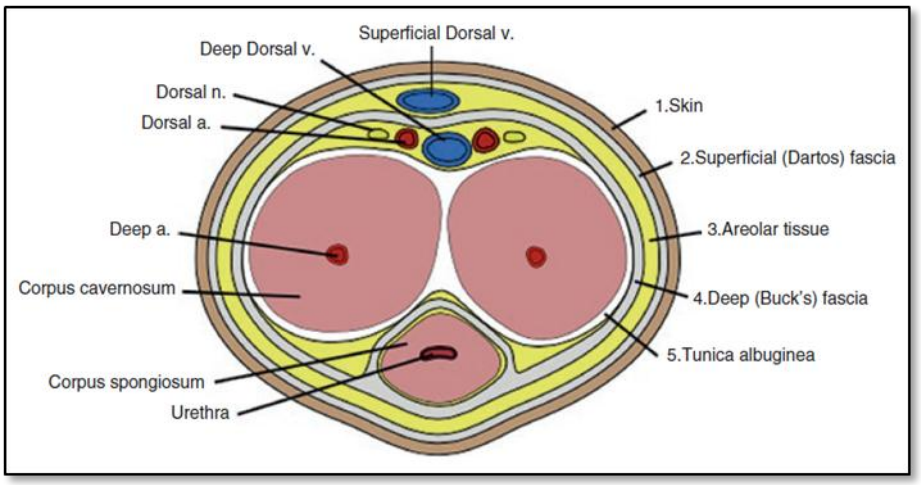

Figure (2): Transverse section of the penis ***(Fahmy, 2017).***

Chapter 3

DIAGNOSIS OF MID PENILE HYPOSPADIAS

Hypospadias is one of the most common congenital malformations in boys. In Egypt, it is estimated that at least one in every 250 boys are born with hypospadias each year. The classification of hypospadias is based on the severity of the malformation and is of great importance, since the choice of surgical technique is based upon it. The most common way to classify hypospadias during external examination is by the position of the urethral opening, which may be distal (60-65% of cases), mid-penile (20-30% of cases) or proximal (10-15% of cases) ***(Giannantoni, 2011).***

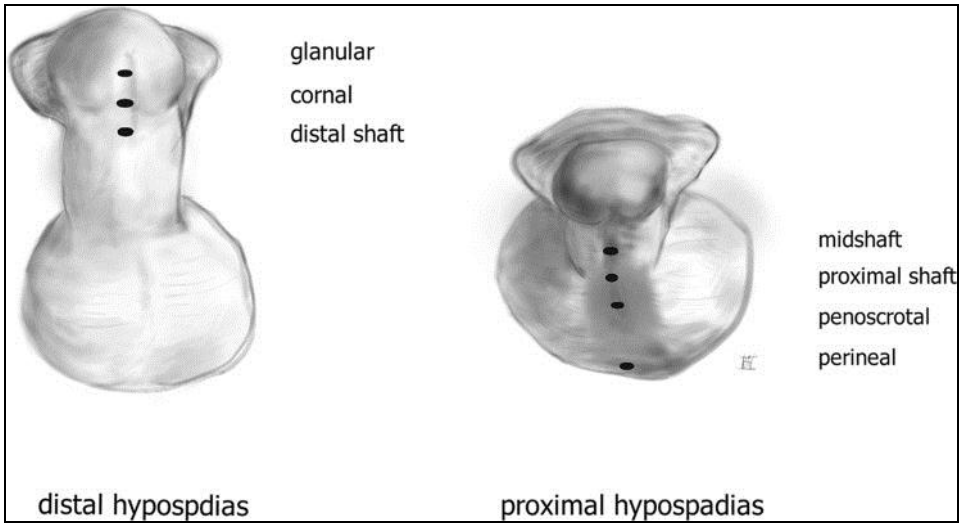

Figure (3): Classification of hypospadias based on preoperative position of the meatus.