SURGICAL REPAIR OF HYPOSPADIAS

THESIS

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PRESENTED By :

MOURAD KALDES PHILOPES

M.B., B.Ch.

SUPERVISED By :

Dr. TAWFIK ZAKI SWIDAN

Professor of General Surgery

FACULTY OF MEDICINE

AIN SHAMS UNIVERSITY

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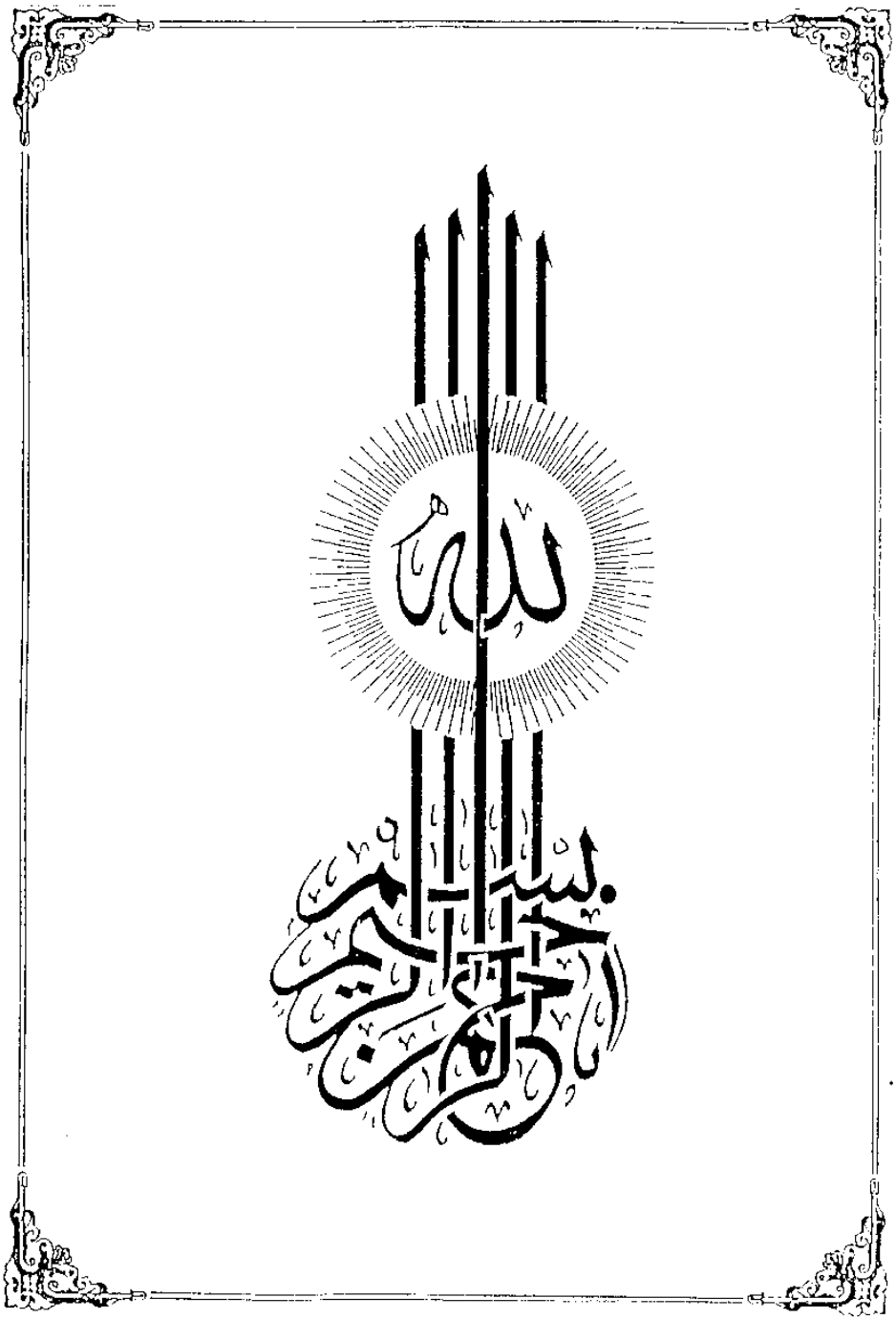
Mourad Kaldes Philopes



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INTRODUCTION

Hypospadias is a congenital anomaly in which the urethra ends on the ventral surface of the penile shaft or in the perineum. It is a complex deformity of varying degree which may be associated with other congenital anomalies. The description of hypospadias is most easily based on the position of the meatus. The most common forms involve distal hypospadias. As the meatus becomes more proximal, the anomaly becomes more uncommon.

Two characteristics of hypospadias require consideration; the ventral curvature of the penis and the abnormal meatal position. When either is sufficiently severe to interfere with normal micturition or intercourse, operation should be considered. It is important to recognize other associated anomalies and to correct obstructive uropathies, prior to beginning surgical treatment.

This congenital anomaly presents challenge not found in other anatomical circumstances. A detailed and specific knowledge of the anatomy, embryology and physiology of the urethra is essential before discussion of the subject. The primary object is to create a functionally adequate penis with a meatus that exits at the appropriate tip of the glans.

The reconstruction of a urethral tube has stimulated the ingenuity of many surgeons and gave us a vast choice of techniques. Innovations have been attempted for many years, beginning with the work of Anger (1874) and Duplay (1880) who employed a burried skin strip in reconstruction of the urethra. This was the first recorded instance of the burried skin strip method which was popularised by Denis-Browne (1949).

In this work we study the procedure, the post-operative follow-up and complications of the Denis-Browne technique as one of the most popular techniques for repair of hypospadias.

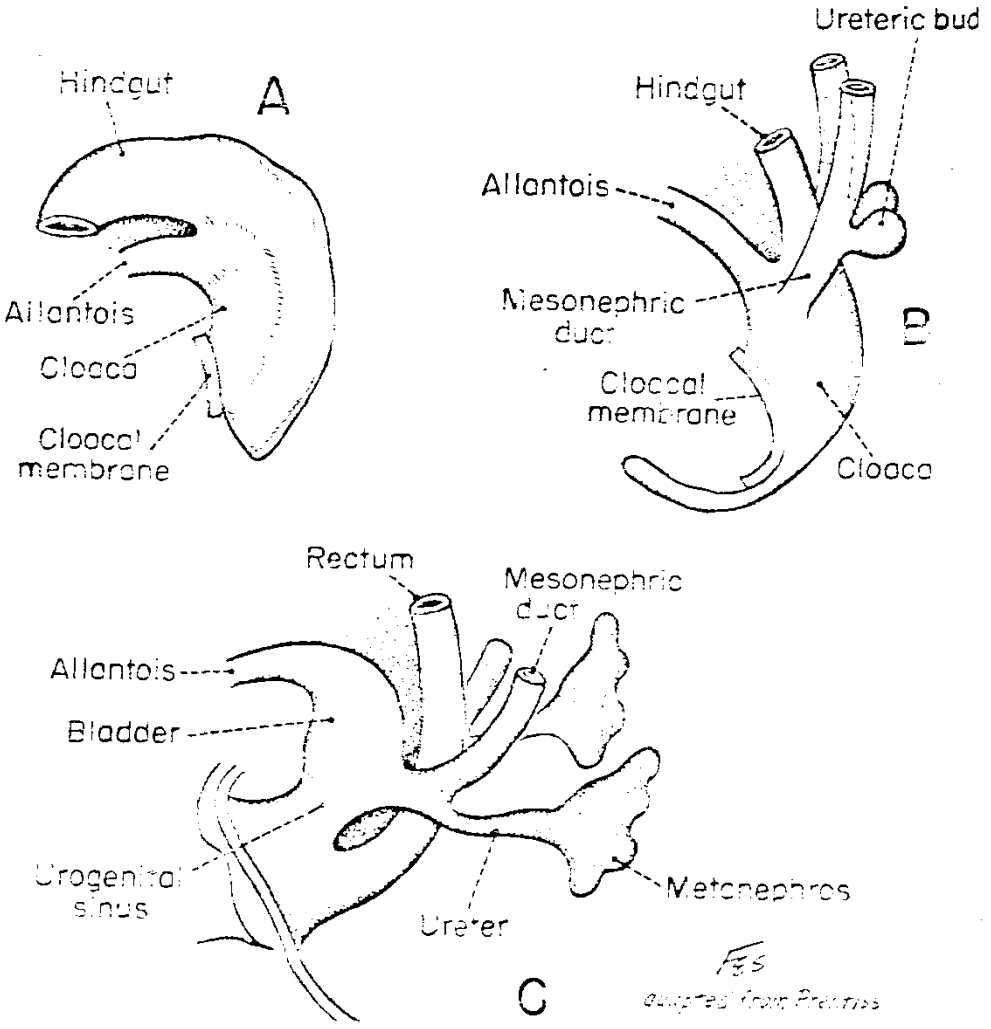
REVIEW OF LITERATURE

Embryology of the penis and urethra

At approximately two weeks of gestation, the cloaca appears, having been formed by the junction of the ventrally outgrowing allantois and the hind gut. These structures develop a closing plate (proctodeum)termed the cloacal membrane. Two weeks later the cloacal membrane bounds the medioventral wall of the cloaca from the allantoic stalk to the tail gut. Shortly afterward during the fifth week, the cloacal (urorectal) septum appears cranially, and the cloacal division begins. Ventrally, the urogenital cloaca forms and dorsally, the rectal cloaca forms. Division will be complete when the septum reaches the cloacal membrane, approximately during the seventh week. At this point the perineal body appears, and anterior and posterior ruptures form the anal and urogenital orifices respectively. (Fig. 1).

The ventral cloaca is the origin of four distinct elements. These are urogenital sinus in the most distal portion, the primitive urethra, the bladder, and the urachus which is situated more cranially and communicates with the allantoic stalk (Arey, 1974).

The termination of the mesonephric ducts in the primitive urogenital sinus divides it into an upper and a



(Fig. 1) Embryogenesis of the cloaca. Division by the urorectal septum forms the bladder ventrally and the rectum dorsally. Quoted from Reconstructive Urologic Surgery, p.p. 256, 1977.

lower portion. The upper portion, the vesicourethral canal is involved in the development of the bladder and the upper urethra. The lower portion, the definitive urogenital sinus, is intimately involved in the developmental history of the external genitalia. In the male, the pelvic portion of the urogenital sinus becomes the prostatic urethra and the membranous urethra (Wilson,1979).

The prostate gland arises from a series of endodermal buds that appear in the lining of the primitive urethra. These buds grow into the dense surrounding mesenchyme, which then differentiates into the muscular and connective tissue components. Whereas buds initially develop throughout most of the length of the urethra, the most extensive development and growth into the prostate are in the area surrounding the termination of the ejaculatory ducts and the verumontanum in the male urethra (Lowsley, 1912).

Development of the male external genitalia begins shortly after virilization of the Wolffian duct and urogenital sinus (Spaulding, 1921)

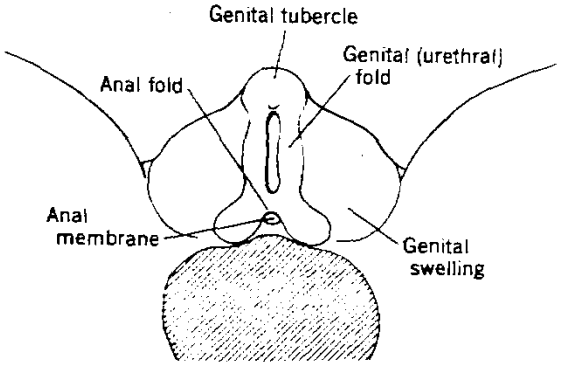
Formation of the genital and lower urinary structures in the male centers around the cloaca and its surrounding

mesoderm. The location of the cloacal membrane at the caudal end of the primitive streak provides the surrounding mesoderm with vast developmental potential. During the fourth week of embryonic life, paired swelling antero-lateral to the cloacal membrane appear. These swellings fuse into a midline structure called the genital tubercle. At the same time, posterolateral anal tubercles form and the lateral mesoderm heaps up to form urethral (genital) folds (Fig. 2).

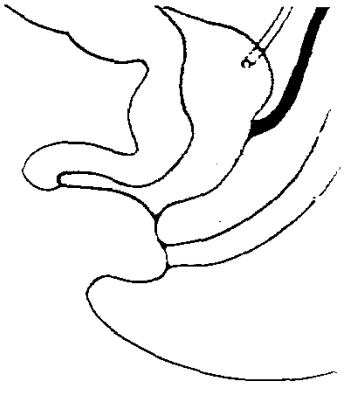
All of these mesodermal components retain the capacity to convert testosterone to dihydrotestosterone, thus heralding the first signs of sexual differentiation.

Normal phallic development occurs between the seventh and sixteenth weeks of intrauterine life and is hormonally mediated. Progressive enlargement of the genital tubercle results in the formation of normal male phallus. As the urorectal septum completes its descent and fuses with the cloacal membrane, the perineal body is formed as mentioned before.

The urogenital sinus then begins to elongate onto the ventral surface of the phallus to the level of the corona, forming the urethral groove which is laterally flanked by mesoderm (Fig. 3) . Convergence of the anterior



(Fig. 2) External genitalia (sexually indifferent). Quoted from Urol. Clin. North Am. p.p. 379, 1981.

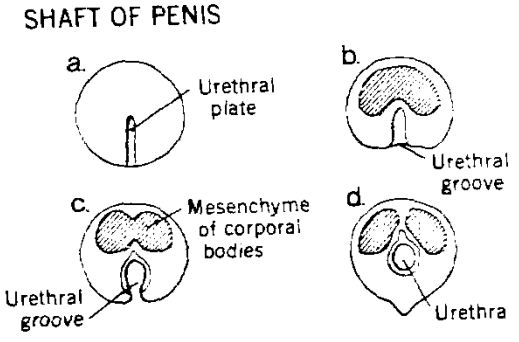


(Fig.3) Extension of the pars phallica of the urogenital sinus onto the phallus, forming the urethral groove. Quoted from Urol. Clin . North. Am. p.p. 380, 1981.

walls of the urogenital sinus results in the formation of an endodermal urethral plate on the floor of the urethral groove. This soon disintegrates, deepening the groove and facilitating the formation of the anterior urethra (Fig. 4). From the indifferent state, the external genital structures develop a typically male configuration under the influence of testosterone. As the phallus elongates, the urethral groove extends to the level of the corona. Gradually, the urethral folds coalesce in the midline, closing the urethra and forming the median raphé of the scrotum and penis. Dorsal to the urethra, mesenchyme coalesces to form the corporal bodies, vascular channels, and nerves (Bellinger, 1981).

The glandular urethra may form by an identical mechanism, although there is considerable controversy surrounding this premise (Devine, 1980). Glenister 1945 believed that the distal glans channel, most likely induced by hormonal and local factors, forms a solid core that tunnels to join the proximal urethra created by closure of the urethral groove. This core later undergoes canalization, forming a completed urethra. Anomalous canalization of this distal channel may be responsible for the blind-ending lacunae magna commonly found in young boys.

The prepuce forms as a ridge of skin that gradually grows to enclose the glans circumferentially (Hunter,1935).



(Fig. 4) Closure of the urethral groove and the formation of the urethra. Quoted from Urol. Clin . North Am. p.p. 380, 1981.

The defect associated with hypospadias is reflected in the deficient ventral prepuce and resultant dorsal hood.

Embryology of the female urethra:

The female urethra is derived from the proximal urethral analogue , the portion above the Wolffian duct opening that normally forms the urethra down to and including the verumontanum in the male, the verumontanum is absent in the female and when hypospadias occurs there are usually incontinence and an anatomic defect of the bladder sphincters.