ISSN: 2581 – 3633
PubMed - National Library of Medicine - ID: 101745081

International Journal of Medical Science and Advanced Clinical Research (IJMACR)

Available Online at:www.ijmacr.com

Volume – 8, Issue – 1, February - 2025, Page No. : 57 – 68

Vaginal Reconstruction with Mcindoe Technique with Bilateral Orchidectomy in Testicular Feminisation Syndrome: A Case Series

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How to citation this article: Meghana Patil, MPA Sailakshmi, Mali Chetan SM, "Vaginal Reconstruction with Mcindoe Technique with Bilateral Orchidectomy in Testicular Feminisation Syndrome: A Case Series", IJMACR- February - 2025, Volume – 8, Issue - 1, P. No. 57 – 58.

Type of Publication: Case Series

Conflicts of Interest: Nil

Abstract

Introduction: Testicular feminization is a syndrome in which a male, genetically XY with negative sex chromatin, is resistant to androgen hormones due to various abnormalities of the X chromosome. This resistance to androgen hormones prevents the formation of male genitalia and results in a female phenotype. Mayer-Rokitansky-Kuster-Hauser syndrome (MRKH) is the most common cause of vaginal absence, followed by complete or partial androgen insensitivity syndrome. Treatment for these patients varies from simple non-operative dilation to the more complicated surgical creation of a neovagina. In this context, we present a series of 5 cases with testicular feminization syndrome who were raised as females and underwent Bilateral Inguinal Orchidectomy and McIndoe's Vaginoplasty with Bilateral Pudendal Artery Perforator Flap surgery, the outcome and quality of life.

Methods: A total of 5 cases of primary amenorrhea which also included two sisters were found to have testicular feminization syndrome (46 XY). Routine investigations were done. All 5 cases underwent bilateral inguinal orchidectomy and McIndoe's vaginoplasty with bilateral pudendal artery perforator flap surgery. Their neovagina width, length, granulation tissue, and stenosis were examined and recorded at follow-up visits. The primary outcomes were the achievement of anatomical and functional success.

Results: The effectiveness of the surgery was assessed by monitoring anatomical and functional outcomes. Donor site healing was adequate. An average vaginal length of 7-8 cm and vaginal width of about 3 cm was achieved. Sexual gratification was satisfactory. There

was no blood transfusion requirement. Major complications were rare, except for local site pain or irritation.

Conclusions: Vaginal reconstruction with McIndoe technique with Bilateral Orchidectomy in Testicular Feminisation syndrome if performed with good surgical skills, is a secure and beneficial way to achieve sexual contentment, with no donor site complications

Keywords: Testicular Feminization Syndrome, Primary amenorrhea, McIndoe Vaginoplasty, Neovaginal construction, Split skin autograft, Sexual Satisfaction

Introduction

Testicular feminization syndrome is a rare inherited condition where a male, who is genetically XY but has negative sex chromatin, is resistant to androgen hormones. This leads to the formation of female genitalia and a female external appearance.[1] It is a form of male pseudo hermaphroditism that occurs in phenotypically normal women with adequate breast development, a vagina of variable depth, normal external genitalia, an absent uterus, and sparse or absent pubic hair and axillary hair. [2] The gonad (undescended testis) may be located intraabdominal, inguinally, or labially. The incidence of testicular feminization syndrome is reported to range between one in 2,000 to one in 62,400 births and can be incomplete or complete.

The male genital phenotype develops in two stages. The first stage is the formation of the testes from primitive gonads during foetal development, under the influence of the sex-determining genetic region located on the Y chromosome. The second stage involves the development of male characteristics of internal and external genitalia, including testicular translocation to the scrotum, in response to androgen hormones produced in the Leydig cells of the testis. If testosterone is absent in the second step or if the function of the androgen receptor (AR) is abnormal, female sexual characteristics develop.[6] Mutations in the AR gene cause malfunctions of the AR, including loss of function and morphological alterations, many of which are associated with AIS (Androgen Insensitivity Syndrome).[7]

AIS is clinically subclassified into three categories depending on the degree of feminization of the external genitalia: complete (CAIS), partial (PAIS), and mild (MAIS). Along with AIS, 5 alpha-reductase deficiency (5aRD) is another representative 46, XY disorder of sexual development (DSDs) that manifests with discrepancies between internal and external genitalia. It is caused by impaired testosterone metabolism, whereas AIS is caused by resistance to the action of testosterone[8]. The estimated prevalence of AIS based on molecular diagnosis is one in approximately 20,000 to 99,000 genetically 46, XY males.[9] The prevalence of AIS was also estimated as 0.8% to 2.4% when inguinal hernias are palpable in phenotypic females.[10]

AIS is an X-linked recessive disease, although sporadic de novo mutations are associated with up to 30% of cases. [6] Of the three subtypes, CAIS is usually overlooked at birth because it results in a complete female phenotype, and it can be diagnosed in infancy only when the parents report a palpable inguinal mass. It is more usually identified because of primary amenorrhea during puberty. Clinical examination reveals a short vagina and no uterus. Imaging techniques confirm the absence of the uterus and ovaries and identify intra-abdominal undescended testes. The karyotype should be confirmed as 46, XY to differentiate AIS from other types of DSD (Disorders of Sexual Development).[11]

Aim

This paper presents a case study of 5 cases with testicular feminization syndrome who underwent surgical management, including Bilateral Inguinal Orchidectomy and McIndoe's Vaginoplasty with Bilateral Pudendal Artery Perforator Flap surgery. The paper covers the procedure done, the outcome and the quality of life post-procedure.

Case Report

This case report includes five cases between the age group 24-26 years who reported to the Obstetrics and Gynecology Department at Raja Rajeswari Medical College and Hospital in Bengaluru with primary amenorrhea. The clinical examination was conducted and Tanner staging was done for pubic hair growth, and breast development. (Table 1) following which local examination was done to determine the development of Labia Majora, Urethral Opening, vulva and the vaginal opening.

Table 2: Preoperative endocrinological analysis

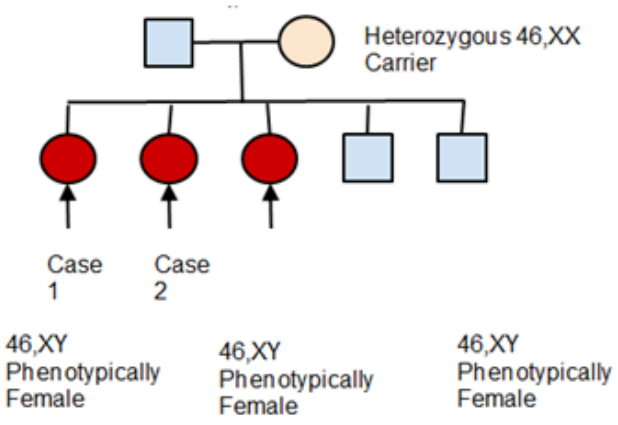
Results of Baseline Hormone Levels of the 5 cases with complete androgen insensitivity syndrome hormone (normal range)

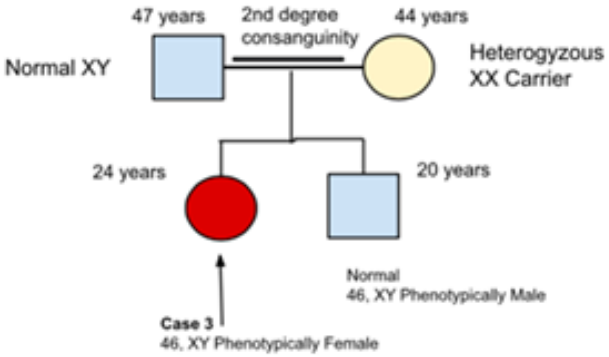
Case	LH (1.2–7.8 mIU/mL)	FSH (1.4–15.4 mIU/mL)	Estradiol (30-400 pmol/L)	Testosterone (3.0–10.6 ng/mL)
1	2.2	3.09	82.28	9.44
2	1.2	2.34	71.72	10.29
3	1.4	3.2	54.44	7.55
4	3.2	2.67	72.45	4.45
5	1.8	1.2	50.22	5.23

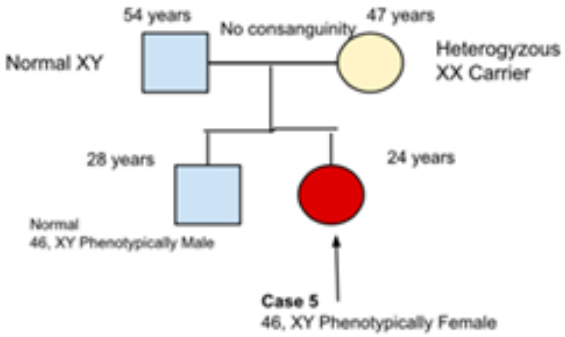
Materials and Methods

The study was conducted in the Department of Obstetrics and Gynecology, RajaRajeswari Medical College and Hospital, Bengaluru between 2022-2024. All the 5 cases who met the criteria for reconstructive surgery underwent modified McIndoe vaginoplasty with a split-thickness skin graft. All these cases were further followed up until a year. A detailed history taking and examination of these patients was done. All the routine investigations required for major surgery along with ultrasound, hormone assessment (Table 1,2) and karyotype were carried out in these patients and pedigree was charted (Figure 1).

The levels of gonadotropins were measured. (Table 2). The karyotype was mapped to differentiate the Androgen Insensitivity Syndrome from other genetic abnormalities, confirming the suspected testicular feminisation diagnosis (46 XY). Preoperative endocrinological analysis was done. (Table 2). Bilateral Inguinal Orchidectomy and McIndoe's Vaginoplasty with Bilateral Pudendal Artery Perforator Flap surgery were planned. The testes were removed to avoid the malignant risk







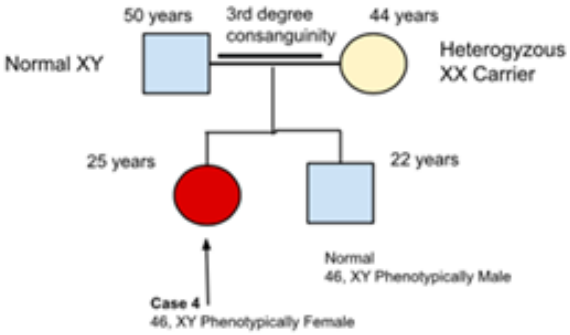


Table 1: Clinical Characteristics of both Cases

Case	Age (at first visit)	Height (in cm)	Weight (in kg)	Breast development	Axillary Hair Growth	Pubic Hair Growth	Vaginal opening (in cm)	Testis (TRxAPxCC) in cm	Kidney (BPL x PT) in cm	Urethral Opening	Uterus and Ovaries
1	26	157	64	Tanner Stage 3	Scanty	Tanner Stage 3	2.0	R: 1.6x1.4x 2.9 L: 2.4x 1.4 x2.6	R: 9.2 x 2.4 L: 8.6 x 2.3	Normal, no fistula	Absent
2	25	156	64	Tanner Stage 3	Scanty	Tanner Stage 3	2.5	R: 1.8x1.3x3 L: 2.4x1.3x2.7	R: 9.3 x 2.3 L: 8.7x2.1	Normal, No fistula	Absent
3	24	160	65	Tanner Stage 3	Scanty	Tanner Stage 3	2.2	R: 1.4 x1.2 x 2.4 L: 1.8x 1.3 x2.4	R: 8.6 x 2.4 L: 8.4x 2.2	Normal, no fistula	Absent
4	25	158	60	Tanner Stage 2	Scanty	Tanner Stage 2	2.0	R: 1.4x1.3x4 L: 1.6x1.4x2.6	R: 9.2 x 2.3 L: 8.9x2.1	Normal, No fistula	Absent
5	24	157	57	Tanner Stage 2	Scanty	Tanner Stage 2	2.0	R: 1.4 x1.2 x 2.4 L: 1.8x 1.3 x2.4	R: 8.6 x 2.4 L: 8.4x 2.2	Normal, no fistula	Absent

No fistula was detected on urethroscopy in all the cases. No renal abnormalities were detected on USG or MRI. A blind short vaginal pouch was noted on clinical examination. A written informed consent was taken from

all the patients explaining in detail about the procedure, the possible complications and the results. All the patients' karyotypes were that of a normal male, i.e., 46, XY. Family screening for genetic counselling was performed.

The clinical scenario was explained to all the cases who were anxiously awaiting marriage. They underwent proper counselling regarding the need for surgery, the complications involved and the outcome including the absence of childbearing ability and psychiatric counselling regarding childbearing ability for the patient as well as the family, and thereafter surgical options were discussed. Having ruled out other endocrine abnormalities, after a thorough preoperative evaluation, they were posted for Bilateral Inguinal Orchidectomy to avoid the malignant risk and Modified McIndoe's Vaginoplasty with a split-thickness skin graft. The plan was to create a neovagina lined by split skin autograft.

Preoperatively patients were prepared for the surgery as per the hospital protocols. The Gynaecologist, Urologist and Plastic surgeon performed the surgery under spinal anaesthesia. A prophylactic antibiotic was given before starting the procedure.

Surgery was started with the patient in the supine position. Bilateral gonads were visualised using ultrasonography and areas for incision were marked. (Figure 2) An open Bilateral Orchidectomy was performed and the skin closed with intermittent sutures. (Figure 3).

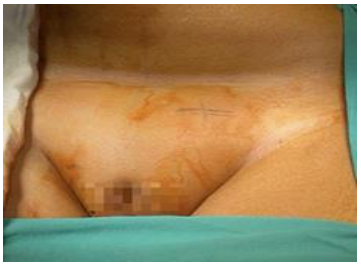


Figure 2: USG guided labelling for

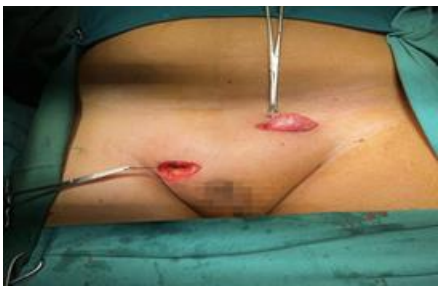


Figure 3: Open Bilateral Orchidectomy

The patient was then put in a lithotomy position and catheterised. (Figure 4). The catheter helps in defining urethral margins clearly during the procedure.

The next steps involve:

A) Creating a new cavity between the rectum and the bladder in the correct anatomical plane, with utmost safety.

B) Preparing an airtight mould, which will be used to secure the dermal graft.

C) Inserting and securely placing the graft-mould assembly into the neovagina.

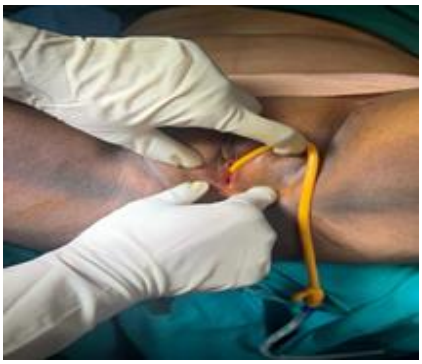


Figure 4: Catheterisation

A neovagina was created by making a 2cm transverse incision and dissection on either side of the midline. (Figure 5) This created a vesicorectal space between the bladder and urethra anteriorly and the rectum posteriorly, below the peritoneal sac. Dilators of increasingly greater diameters were then inserted sequentially to a depth of approximately 7-8 cm deep and 4 cm wide, creating space between the bladder and rectum. Once enough space was created, the median

remnant raphe was excised. (Figure 6) Haemostasis was achieved during the creation of the neovaginal space, and the space was examined for any injury to adjacent organs. A mop soaked in adrenaline solution was placed in the cavity.

Figure 5: Creation of a neovagina

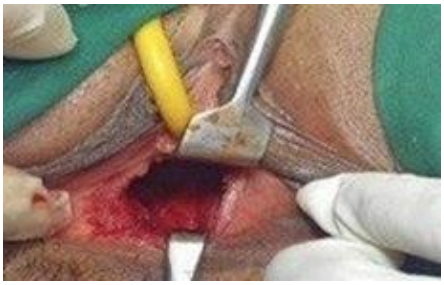


Figure 6: Neovagina

A Vaginal Dilator of appropriate size was wrapped with a sterile sponge. (Figure 7A) The sponge ends were sutured with no. 2 silk. (Figure 7B) A thick condom was placed over the sponge and tied at one end to make it airtight and collapsible. (Figure 7C) A skin graft of approximately 14×8 cm was harvested (Figure 7D) from the medial aspect of the thigh using Humby's knife. (Figure 7E, F) The donor site was dressed under aseptic precautions.

Multiple splits were made and washed in saline mixed with an antibiotic solution. This mould was then covered with an antiseptic paraffin-impregnated gauze dressing (Bactigras) to enable easy removal later. (Figure 8A)

The graft was spread over the mould with the raw surface facing outward and reverse sutured over the sponge mould with 3-0 monofilament absorbable suture material (Catgut 3-0). (Figure 8B)

The graft-mould assembly was inserted into the cavity, (Figure 8C) and the labial folds were sutured by interrupted absorbable suture material to keep the mould in position. (Figure 9) Tight dressing was applied to the area.

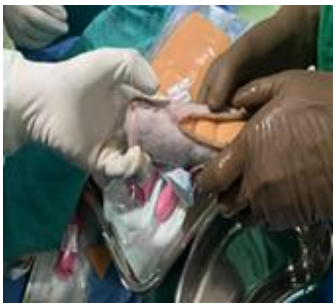


Figure 8 A:

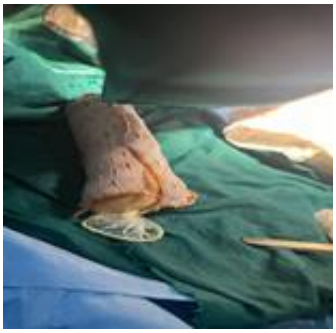


Figure:8 B:

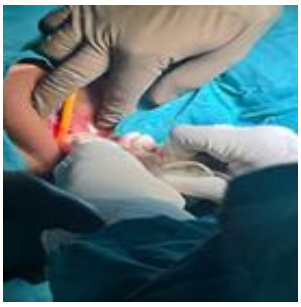


Figure 8 C:

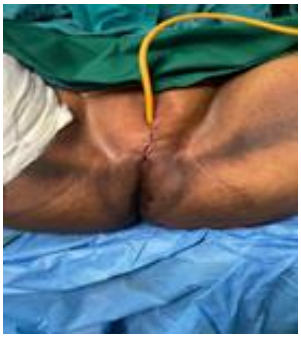


Figure 9: Labia closed by

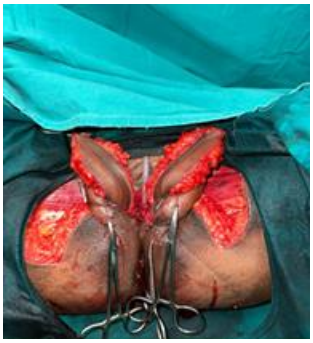


Figure 10 A:

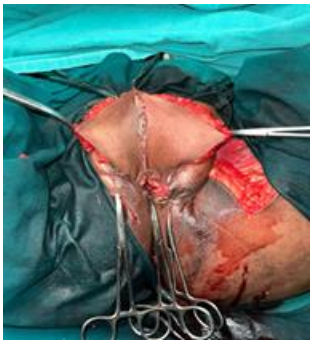


Figure 10 B:

Figure 10 C:

The postoperative period was uneventful and managed with adequate hydration, analgesics and broad-spectrum antibiotics. A liquid diet was started six hours following surgery. A semisolid diet was recommended for three days. After 5 days, the labial sutures were removed and the mould was removed carefully. The cavity was cleaned with diluted iodine solution, a thorough saline wash was done and the graft uptake was observed. A second mould was again reinserted and placed in position. A second look was done after 5 days. Graft was taken up well. Fresh plastic mould covered with Cuticell and Placentrex was placed in the neovaginal pouch after debridement. Neovaginal raw areas with small interrupted islands of graft were noted. Bilateral Pudendal Artery Perforator Flap Surgery for resurfacing the neovaginal area was done 5 days after the graft's second look by harvesting an 8x4x1cm flap from the groin crease,(Figure 10A) tunnelling towards the Neovaginal area (Figure 10B). Mould was placed thereafter. (Figure 10C)

Outcome and Follow-Up

After surgery, testis were submitted for histopathological study. The histopathological study reports of both sisters revealed atrophic seminiferous tubules with marked Leydig hyperplasia detected in the bilateral testis. Similar histopathological findings were obtained by Gad El-Moula et al [9] in a female with androgen insensitivity syndrome.

Postoperative endocrinological analysis showed the level of testosterone and other hormones to be within the normal range of both sisters and other patients. The patients and family were explained medical, sexual and nil reproductive possibilities.

Patients were trained about the removal and reinsertion of the silicone penile mould to maintain the length and width of the neovagina. They were instructed to keep the mould in place, under aseptic precautions, constantly for the first 3 months with removal only during the time of

vaginal irrigation, defecation and urination, followed by its use only in the night for the next 2-3 months. They were asked to use vaginal dilators regularly and followed up every six weeks. At each follow-up visit, the width, length, granulation tissue, and stenosis of the neovagina were examined and recorded. Sexual intercourse was allowed after 6 months. Initially, lubricative jelly was asked to be used by the patients during sexual intercourse. Per speculum examination was done for all the patients during follow-up.

The primary outcomes were the achievement of anatomical and functional success. Anatomical success was defined as a neovagina in which two fingers could be inserted easily and with a length greater than 6 cm within 6 months after surgery. Functional success was defined as when the patient was satisfied with sexual action 6 months after surgery. Functional outcomes were assessed by the Female Sexual Function Index (FSFI). Patients who had commenced sexual activity completed the FSFI questionnaire at 12 months after surgery.

Results

All the patients in our case series were in the age group of 25-26 years. They were all unmarried and about to get married in the duration of the next 6-10 months. The uptake percentage of split-thickness skin graft was evaluated on the seventh postoperative day, after the removal of the initial mould. Subsequently, the sloughed-off graft was trimmed, and the healing process was monitored during subsequent visits with secondary intention. The depth and width of the vagina were assessed before and six weeks after the surgery, and the results were documented. (Table 3) Sexual gratification was determined based on the individual patient's verdict about the contentment of the neovagina.

There were no blood transfusions required for either of the cases, and no major complications were encountered, apart from local site pain or irritation.

Discussion

Individuals with complete androgen insensitivity syndrome (CAIS) are hormone-resistant. They typically have testosterone levels within or higher than the normal range for males, and may have higher than normal LH (luteinizing hormone) levels. However, their FSH (follicle-stimulating hormone) and inhibin levels are usually normal. Serum estrogen levels in CAIS patients are usually higher than those in normal males but can be normal or lower than those in normal females. Despite this hormonal profile, CAIS patients are phenotypically female, with typical female body habitus and secondary sexual characteristics. The diagnosis is usually made during puberty or later in life when patients experience amenorrhea or have difficulty with intercourse. [16]

Table 3: Results of the procedure

Categories	Case 1	Case 2	Case 3	Case 4	Case 5
Pre-Operative Depth of Vagina	2.0cm	2.5cm	2.2 cm	2.0 cm	2.0 cm
Percentage of graft uptake	80-90%	80-90%	80-90%	80-90%	80-90%
Post-Operative Depth of Neo-Vagina	Upto 7cm	Upto 8cm	Upto 7cm	Upto 8 cm	Upto 7cm

Post-Operative Width of Neo-Vagina	Upto 3cm	Upto 3 cm	Upto 3.2 cm	Upto 3 cm	Upto 3 cm
Post-Operative Drop in Hemoglobin levels	1.7g/dL	1.5g/dL	1.2g/dL	1.0g/dL	1.4g/dL
Blood Transfusions	Nil	Nil	Nil	Nil	Nil
Use of Chronic Pain Killer (>6 weeks)	Nil	Nil	Nil	Nil	Nil
Complications	Labial pain, Catheter site irritation	Catheter site irritation, Graft site pain	Labial pain, Catheter site irritation, Graft site pain	Catheter site irritation, Graft site pain	Labial pain, Catheter site irritation

Patients who suffer from sexual displeasure due to various psychological issues and body accentuation problems may experience low self-esteem. [17,18]

Constructing a neovagina can help improve their self-esteem by satisfying both partners sexually.[19]

In the past, different non-operative and operative methods have been used for neovagina construction. The purpose of all these procedures is to create a vagina that looks, feels and functions satisfactorily without causing major morbidity. The first vaginal reconstruction surgery was performed by Amussat in 1832. [20] The non-operative method involves using vaginal dilators, but this is only suitable for highly motivated individuals who do not want to undergo surgery. [21] There are various operative methods, including flap techniques, buccal mucosa grafts, amnion grafts, bowel loop substitution, peritoneal methods and skin graft techniques.

Many other methods of vaginal reconstruction have been reported in the literature. A non-operative technique, also known as a Frank procedure, can be used if the vaginal pouch is present. The Frank procedure involves progressive mechanical dilation using graduated hard dilators to create progressive invagination of the vaginal pouch. [12] This procedure may not have good results in patients with a vaginal dimple.[13]

The use of a bowel segment for vaginoplasty was first reported in 1904 by Baldwin. [14] Goligher [15] reported positively about his experience with a pedicled portion of the sigmoid colon for the construction of a neovagina in the early 1980s. Hensle and Reiley reported their experience in 20 patients who underwent Vaginoplasty and stated that the sigmoid colon is better suited for vaginal replacement because of its long mesentery.

Among these, the modified McIndoe vaginoplasty using a split-thickness skin graft is highly accepted due to its simplicity, efficacy and lower morbidity.[22] The McIndoe technique using split-thickness skin grafts was first described by Bainster and McIndoe in 1938. [23,24] Hojsgaard A et al [26] found that this technique had no complications and did not require repeat interventions.

It is important to note the possible drawbacks of vaginoplasty surgery, which includes the formation of fistulas, partial or complete obstruction of the vagina, the need for additional surgery, and the long-term use of a mould to maintain the shape of the neovagina and prevent it from closing up again. Skin grafts or amnion may be used to cover the mould to prevent vaginal stenosis. Various modifications to the procedure have been described, such as the use of a plastic syringe mould wrapped with interceed by Kalpdev,[31] who found it to be effective and well-tolerated by patients.

Similarly, Yasmin used a 20-cc disposable plastic syringe mould wrapped with soft tulle and noted that it was a cost-effective and innovative approach that reduced the duration of surgery and associated complications.[32]

Graft uptake was about 80-90% in both cases, which is comparable to a study conducted by Garcia and Jones[29] which reported complete (100%) graft uptake in 73% of the patients on the 10th day after surgery, and 80-90% graft uptake in another 20% of their patients. Buss and Lee also reported 80-90% of graft uptake in their study. [28]

The postoperative drop in haemoglobin levels was comparable to the study conducted by Klingele CJ et al in 2003[27]. Blood loss during the surgery was not significant, and there was no need for blood transfusions in this study. Similar results were observed in a study conducted by Motta GL et al. [30]

The patients have a cosmetically acceptable vagina and are sexually active and doing well.

Conclusion

To improve the quality of care, a multi-disciplinary approach is necessary for the diagnosis and treatment of testicular feminization. It requires close collaboration between gynaecologists, endocrinologists, geneticists, urologists, and psychiatrists. The condition causes an inability to lead a normal sexual and reproductive life, which can cause significant social inhibition and psychological distress for affected individuals. Surgical techniques can provide a solution to the physical inability, including surgeries that offer an appropriate length of vagina and adequate space without scarring.

Bilateral orchiectomy is essential to prevent malignant transformation. The modified McIndoe vaginoplasty is a secure and beneficial way to achieve sexual contentment in patients with Testicular Feminising Syndrome and Vaginal agenesis. It has no donor site complications if performed with good surgical skills. Careful dissection in the midline, haemostasis, and regular use of moulds during periods of sexual inactivity are important for successful graft uptake and functional results. Patients must perform postoperative dilation to avoid contracture and shortening of the neovagina. Preoperative counselling remains an important component of the surgical process. The McIndoe procedure is simple and reproducible, with successful, safe, and satisfactory long-term results. Using a split-thickness skin graft for vaginal reconstruction in such patients is a safe and successful method with no occurrence of vaginal contraction or shortening. This method has several benefits, including being a straightforward procedure that does not require laparotomy or intestinal surgery. It has very low morbidity and no mortality, guarantees an accurate anatomical location and orientation of the neovagina, has a good aesthetic donor site, and provides acceptable sexual satisfaction.

The purpose of the study was to evaluate the procedure, outcome, and follow-up, as well as the quality of life and sexual function in individuals after undergoing the McIndoe procedure for Testicular Feminising Syndrome. With an expected rise in the demand for such procedures in the coming years, it is crucial to have adequate surgical training, clinical/surgical experience, and research outcomes to provide the best possible care for this patient population.

However, it is necessary to conduct a large-scale study to evaluate the efficacy of vaginal reconstruction for Testicular Feminisation Syndrome patients using split-thickness skin grafts.

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