International Journal of Scientific Research in Dental and Medical Sciences

www.ijsrdms.com

Novel Custom-made Heat Cure Acrylic Stent for Vaginal Agenesis: A Case Report

Rajthilak Boomiraj*, Romil N Jain, Rachapudi Venkata Roshini, Gayathri Devi SK, Ravishankar Krishna, Baba Shankara Alva

Department of Prosthodontics, Faculty of Dental Sciences, Ramaiah University of Applied Sciences, Bangalore, India

ARTICLE INFO

Article history:
Received 13 April 2023
Received in revised form 18 May 2023
Accepted 21 May 2023
Available online 25 May 2023

Keywords:
Mullerian Aplasia
Polymethyl Methacrylate
Silicones
Stents
Vagina

ABSTRACT

The Mayer-Rokitansky-Kuster-Hauser syndrome is most commonly associated with vaginal agenesis, a congenital anomaly of the female genital tract. To correct vaginal agenesis, a neovaginal cavity between the bladder and the rectum must be formed. Following surgical reconstruction of the vaginal space, a long-term vaginal stent is required to maintain vaginal width and depth while preventing contraction. This case report describes a novel technique for managing the postsurgical condition of a 22-year-old female patient diagnosed with MRKH syndrome referred to the Department of Prosthodontics for a custom-made heat-cure acrylic Polymethyl methacrylate (PMMA) vaginal stent fabricated by a Maxillofacial Prosthodontist.

1. Introduction

The vagina is a muscular and elastic organ in the female genital tract that connects the external genitals to the uterine cervix. It is located between the urethra and anus. In the vaginal wall, many muscles and elastic fibers are covered by a mucous membrane, making it flexible and soft. The presence of numerous nerve endings contributes to its high sensitivity. The absence or presence of a rudimentary vagina is defined as vaginal agenesis/hypoplasia. The most common disorders are Mayer-Rokitansky-Kuster-Hauser Syndrome (MRKH) and Complete Androgen Insensitivity Syndrome (CAIS), which have a global prevalence of 1 in 4,000 and 1 in 13,000, respectively.[1] MRKH syndrome/Mullerian agenesis is a female congenital anomaly caused by a vaginal developmental failure from the Mullerian duct, resulting in uterine aplasia or the presence of a rudimentary uterus and upper part of the vagina. Normal ovaries and external genitalia characterize vaginal agenesis but only a vaginal dimple or a vaginal pouch with a blind-ending in women. They go through puberty and develop breasts, underarm, and pubic hair, except menstrual bleeding (all typical secondary sexual characteristics). Patients typically complain of cyclical lower abdominal pain, back pain, an abdominal lump, and cryptomenorrhea. If left untreated, this condition can lead to hematometra, hemtocolpos, endometriosis, or pyometra, which can endanger fertility.[2] Vaginal agenesis can be treated non-surgically or surgically. One of the most common procedures for neovaginal reconstruction is Abbe McIndoe vaginoplasty. It entails surgically creating a vaginal cavity lined with thick split-thickness skin grafts (SSGs).[3] McIndoe's vaginoplasty with SSG obtained from the thigh or buttocks was used to treat these patients surgically. Autologous grafts, such as buccal mucosa, and the application of fat granule injection as a supporting structure in the graft site can improve the degree of simulation.[4] Allografts, such as amnion, have been used to line the neovagina, potentially reducing morbidity at the graft donor site. These methods of treating vaginal agenesis surgically have been proven to be more promising than non-surgical methods. However, using a vaginal stent or dilator post-surgery remains a cornerstone of vaginal agenesis treatment.[5] According to the literature, non-surgical methods involve using vaginal dilators when the vaginal dimple is 2 to 4 cm deep. The elastic nature of the vagina makes its tissues expand during the insertion of the dilator. In order to accomplish this, dilators are made with increasing length and diameter whenever required.[6] Vaginal stents should be used regularly to avoid neovaginal shrinkage and stricture and maintain vaginal width and depth after surgery.[7] Prefabricated vaginal stents are available in various sizes and materials. However, it is unsuitable for all clinical situations as the anatomy or the postsurgical site differs for each patient. Previous literature has reported using customized stents like ORFIT "S" vaginal stents, tissue expanders, simple syringes, inflatable stents and acrylic, hollow acrylic stents lined with silicones, and customized silicon stents.[8] Due to silicones' drawbacks like the high cost, deterioration over time, and susceptibility to infections if not maintained well,[6] acrylic was chosen in the present scenario. The following

* *Corresponding author. Rajthilak Boomiraj*
E-mail address: *rthilak31@gmail.com*
Department of Prosthodontics, Faculty of Dental Sciences, Ramaiah University of Applied Sciences, Bangalore, India
https://doi.org/10.30485/IJSRDMS.2023.394877.1486

CC BY

case report describes the fabrication of a customized heat cure acrylic (PMMA) stent for a 22-year-old female patient surgically treated for vaginal agenesis.

2. Case Presentation

A 22-year-old female patient was referred by the Department of Plastic Surgery to the Department of Prosthodontics, Ramaiah University of Applied Sciences, Bangalore, to fabricate a vaginal stent. Following surgery, patency was maintained temporarily for about two days with the help of a condom loaded with gauze into the neovaginal tract and inflating it. The patient was advised to use a definitive stent for regular usage in order to maintain patency. The definitive stent was constructed with heat cure acrylic. Based on the condom and gauze pack (Fig. 1), a stent with dimensions of 8.5cm x 3cm was planned for fabrication.

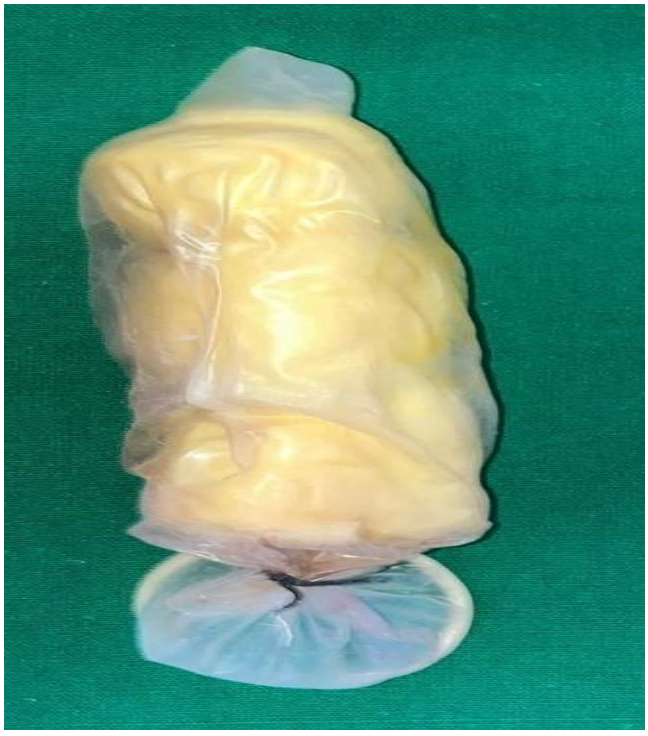

Fig. 1. Condom and gauze pack.

The body of a 2ml syringe was used to fabricate the wax pattern. The modeling wax was adapted in a cylindrical shape over the syringe. The wax pattern was shaped into a long, cylindrical tube with a rounded top, a flat base, and two extensions for easy stent placement and removal (Fig. 2). The wax pattern was later placed in a flask (No. 28- maxillofacial flask). The first layer of Type I Gypsym (Plaster of Paris) investment material is placed in the lower part of a flask, and the wax pattern is later invested to half its thickness, as shown in (Fig. 3). The excess material is trimmed and smoothed with the plaster knife during the initial set. The fit of the upper half of the flask is checked. After the final set, the separating medium was applied, the flask was filled, and the lid was closed with a second pour of the gypsum product. Later the screws of the flask were tightened on and left for a final set of the type of gypsum investment material. After the dewaxing of the wax pattern was done by immersing the flask in hot water for 20mins, the flask was allowed to cool, and a separating medium (Dpi Heat Cure Cold Mould Seal Dental Product of India Pvt. Ltd., Mumbai) was applied. Heat-cure denture base material (Ruthinium Acrypol Plus, Ruthinium Dental Products Pvt. Ltd., New Delhi) was mixed according to the manufacturer's instructions and packed. Salt was used as a medium to maintain the hollow nature of the stent.[9] The flask was bench cured for 150 minutes before curing; then, the flask was kept in an acrylizing unit for curing at 100° C for 120 minutes. After the curing cycle, the acrylic stent was retrieved. Two holes were made at the bottom of the stent to remove the salt by immersing it in water. Later any remaining salt was rinsed out with a syringe and water. The holes were closed with self-cure acrylic material. The stent was trimmed and polished (Fig. 4).

Fig. 2. Fabrication of wax pattern.

Fig. 3. Wax pattern invested in a flask.

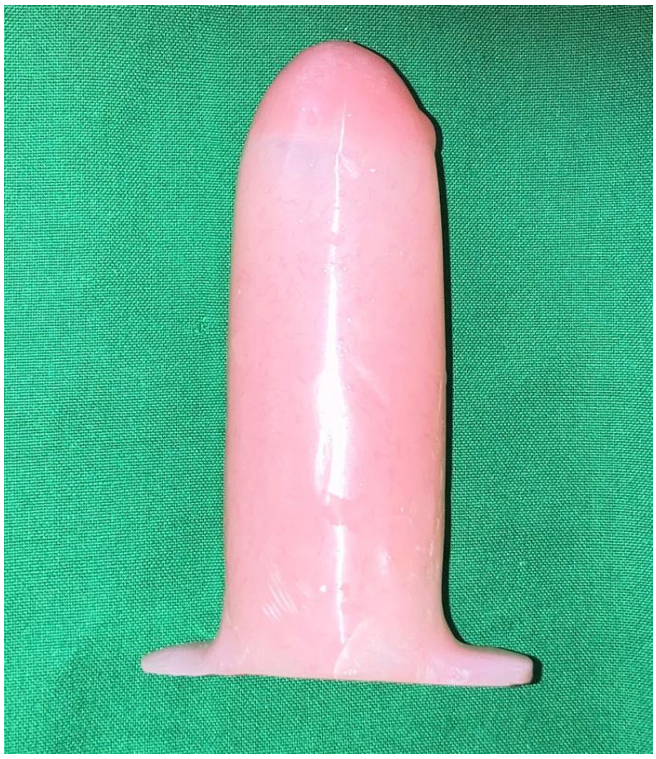

Fig. 4. Heat-cure acrylic vaginal prosthesis.

Prosthesis insertion

A polished prosthesis was inserted in the neovaginal cavity with lignocaine gel. The fit of the prosthesis was assessed using GC fit checker advance[10], and all the exposed region was trimmed. The final polished vaginal stent was inserted, and the patient was educated regarding the insertion and removal of the prosthesis.

Post-operative instructions

The patient was given post-operative instructions to wear the heat-cure stent for 24 hours a day, and the stent was to be kept in place with the help of tight pants/underwear. Before inserting the vaginal stent, lignocaine gel was applied to reduce pain and act as a lubricant. The patient was educated regarding maintaining the stent's hygiene by washing it with soap and water.

Follow-up

The patient was evaluated one month after surgery. During functional movements, the prosthesis was stable. The patient could insert the prosthesis herself, and hygiene maintenance was acceptable. The patient was pleased with the current prosthesis and felt at ease. The neovaginal tissues contracted minimally as the tissues heal, and the patient reported no discomfort. Therefore the patient was encouraged to use the constructed prosthesis regularly. Also, as the patency was maintained adequately, there was no requirement for modifying the size of the heat cure stent.

3. Discussion

The absence of vaginal development is a major congenital anomaly of the female genital tract that can occur as an isolated developmental defect or as part of a complex anomaly. The MRKH syndrome, first described by Hause and Scheiner in 1961, is characterized by vaginal agenesis. It is frequently associated with abnormalities of the renal and skeletal systems, as well as normal female genotype, phenotype, and endocrine status.[7] Treatment approaches involve surgical and non-surgical methods. Several surgical methods have been advocated in the previous literature. The most common is the McIndoe vaginoplasty.[11] The vagina, a self–cleansing organ, cannot maintain its function in cases of vaginal agenesis. Several epithelial debris and sebaceous secretions accumulate in the skin of neovagina, which makes it difficult to clean. These factors decrease the quality of life of patients. Therefore, surgical techniques have been replaced with conservative techniques, resulting in fewer complications whenever possible.[12] According to Rathee M et al., the non-surgical method of using a vaginal dilator is recommended as the first line of treatment. They involve the insertion of a dilator into the vaginal depth by creating vaginal molds of specific length and width. This aids in local pressure, creating space between the rectum and bladder.[13] Frank, in 1938 advocated using rigid acrylic dilators for the non-surgical management of vaginal agenesis. Later, this technique was modified by Ingram. Non-surgical methods have the advantages of minimal morbidity and complications, low cost, total patient control, high success rate, and self-cleansing capacity. However, several disadvantages are associated with these dilators when they are not used sequentially and when the recall and review have not been done. The causes of failure of non-surgical methods are lack of compliance to wear dilator, pain and discomfort, and inconvenience.[12] In the present case report, a condom packed with gauze was used to obtain the dimensions of the vaginal stent, as recording an impression was impossible due to the condition. Recording an impression (dental impression material) may disturb the graft and also hold the chance of material slipping into the operative region. As described, fabricating a vaginal stent using heat cure acrylic was effective. The prosthesis was lightweight and comfortable for the patient because it was hollow inside. This prosthesis was designed to be simple enough for the patient to remove and wear independently. The vaginal stent was made hollow, but both ends were closed to reduce the weight of the prosthesis. The top end was rounded, and the base was kept flat, along with two small extensions for easy placement and removal of the prosthesis by the patient. A hollow prosthesis was achieved by adding salt during the processing of heat-cure material. After heat polymerisation, the salt was removed by placing two small holes at the base of the stent. From one hole, water was injected with the help of a syringe, and through the other hole, excess salt was removed.[14] One of the advantages of the technique described in this article was the use of tight underwear, which applied firm, continuous, and constant pressure to the vaginal tissue without using the patient's hands. Eshona Pearl stated that acrylic resin vaginal prostheses are hard. They help to achieve better functional success and reduce the chances of restenosis.[2] Previous literature has also emphasized using acrylic hollow dilators, replacing conventional solid acrylic dilators. The weight of the prosthesis decreases in the case of hollow dilators, which provides comfort and ease during the insertion and removal of the prosthesis.[12] Other materials of choice are silicone and cold cure acrylic material. Because silicone prostheses are softer and more flexible, they may fail to achieve the desired vaginal size. It can also deteriorate and tear over time. Silicone vaginal stents, if not properly maintained, are more susceptible to fungal infections and deterioration over time.[6, 15] Cold/Self-cure acrylic material is not advisable because residual monomer in the cold-cure acrylic causes tissue irritation.[2] The most common complication associated with a vaginal stent is urethral dilation. However, the complications post-surgery is even higher. Therefore, the procedure is technique-sensitive, posing a challenge to maxillofacial prosthodontists.[12]

4. Conclusion

The vaginal tissue is an elastic tissue that expands when a dilator is inserted. However, achieving this goal will take several months. Hence a vaginoplasty followed by an appropriate stent is the gold standard. The role of a Prosthodontist is significant in the planning and constructing the vaginal stent. A low-cost acrylic stent that could be easily constructed was used successfully in the present scenario.

Conflict of Interest

The authors declared that there is no conflict of interest.

Acknowledgements

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

References

[1] Abrar S, Rizvi R, Zia-Ul-Islam M. Vaginal Reconstruction in Patients with vaginal agenesis: Options and Outcome: A single-center experience. Pakistan Journal of Medical Sciences. 2023;39(1):219-222. https://doi.org/10.12669/pjms.39.1.6356.

[2] E EP, A MJ, Sreelal T, Mohan A, Chandran VB, B SM. Neovaginal Prosthesis - Hallmark in the Management of Patients with MRKH Syndrome – A Case Report. Saudi J Oral Dent Res. 2020;5(8):402–7. https://doi.org/10.36348/sjodr.2020.v05i08.008.

[3] Mishra B, Janavar G, Pradeep Y, Singh AK, Kumar V, Upadhyay DN. Indigenous technique of fabricating vaginal mould for vaginal reconstruction and uterine drainage in McIndoe vaginoplasty using 10 ml syringe. Indian Journal of Plastic Surgery. 2016;49(01):76-80.https://doi.org/ 10.4103/0970-0358.182230.

[4] Yu Y, Ling Z, Jing Z, PengHua Z, XiongWen Q. Fat Injection as a Supporting method in Grafting of Skin Particles Combined with Oral Mucosa in Vaginal Agenesis Repairing. 2023. https://doi.org/10.21203/rs.3.rs-2349207/v1.

[5] Nimonkar SV, Belkhode VM. Hollow vaginal stent for a case of Mayer-Rokitansky-Kuster-Hauser syndrome: a case report. Pan African Medical Journal. 2021;38:343.

[6] Kamalakannan J, Murthy V, Kularashmi BS, Jajoo K. Customized silicone vaginal stent. The Journal of Obstetrics and Gynecology of India. 2015;65(4):281-3. https://doi.org/10.1007/s13224-015-0734-5.

[7] Rathee M, Boora P, Kundu R. Custom fabricated acrylic vaginal stent as an adjunct to surgical creation of neovagina for a young female with isolated vaginal agenesis. Journal of Human Reproductive Sciences. 2014;7(4):272-5. https://doi.org/10.4103/0974-1208.147496.

[8] Lodhi TG, Patil SB, Bahetwar SK, Sharma AB, Warhekar AM. Role of Prosthodontist in Mullerian Agenesis: A Case Report. International Journal of Dental Science and Innovative Research. 2019;2(2):182-186.

[9] Lakshmi CS, Pai SA, Ramachandra K, Afzaa SS, Kouser A. Rehabilitation of the patient with a partial maxillectomy defect with an interim hollow bulb obturator. The Saint's International Dental Journal. 2022;6(2):52-5. https://doi.org/10.4103/sidj.sidj_18_22.

[10] Tasaka A, Shimizu T, Yamashita S. Intraoral scanner and computer-aided design/manufacturing technology for the fabrication of double-crown-retained removable dental prosthesis: A clinical report. Journal of prosthodontic research. 2022;66(3):519-23. https://doi.org/10.2186/jpr.JPR_D_21_00127.

[11] Bhalerao AV, Mehta J, Dixit P, Naphade SA. Comparative Study of Creation of Neovagina Using Skin Graft and Interceed in Mayer–Rokitansky–Küster–Hauser Syndrome. Journal of South Asian Federation of Obstetrics and Gynaecology. 2022;14(3):233-7.

[12] Frank RT. The formation of an artificial vagina without operation. American Journal of Obstetrics and Gynecology. 1938;35(6):1053-5. https://doi.org/10.1016/S0002-9378(38)90400-4.

[13] Rathee M, Chauhan M, Jain P, Shetye A. Customized hollow surgical stent for congenital vaginal agenesis in early adolescent female with MRKH syndrome: a case report. Nigerian Journal of Plastic Surgery. 2020;16(1):39-43. https://doi.org/10.4103/njps.njps_8_19.

[14] Rathee M, Chahal S, Alam M, Jain P, Divakar S, Singh S. Prosthetic rehabilitation following segmental maxillectomy confluent with an orbital defect using a hollow orbital prosthesis retained magnetically with an obturator: A case report. Journal of West African College of Surgeons. 2023;13(1):98-102. https://doi.org/10.4103/jwas.jwas_234_22.

[15] Raza FB, Raju K, Babu A, Vaidyanathan AK, Mehta BS. Customised Vaginal Stent–The Phases in Management of Vaginal Agenesis in Mayer-Rokitansky-Küster-Hauser (MRKH) Syndrome. Journal of Family and Reproductive Health. 2023;17(1):54-7. https://doi.org/10.18502/jfrh.v17i1.11978.

How to Cite this Article: Boomiraj R, Jain RN, Roshini RV, SK GD, Krishna R, Alva BS. Novel Custom-made Heat Cure Acrylic Stent for Vaginal Agenesis: A Case Report. International Journal of Scientific Research in Dental and Medical Sciences. 2023;5(2):107-110. https://doi.org/10.30485/IJSRDMS.2023.394877.1486.