

Comparison of a modified Mogen clamp and classic dorsal slit circumcision under local anesthesia: A clinical study

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Abstract

Background: Currently, although various methods are used, there is no gold standard method for circumcision. Therefore, we developed a modified circumcision clamp inspired by the Mogen clamp suitable for circumcisions performed under local anesthesia in our country. To evaluate its success and complications, we compared our modified Mogen clamp with a dorsal slit circumcision.

Materials and methods: From 2013 to 2017, we retrospectively evaluated 1309 patients who had undergone circumcision; of these, 832 used the modified Mogen clamp method (Group 1) and 477 used the dorsal slit method (Group 2). The patients' age, surgery duration, minor hemorrhage (not requiring suture or repeated surgical exploration after circumcision but with buffer or clotting solution used), major hemorrhage (hemorrhage requiring suture or exploration), redundant prepuce skin remnants, revision numbers, and family satisfaction values were evaluated and compared between the 2 groups.

Results: Patients were assessed at least 3 times: 1 day, 1 week, and 1 month after circumcision. The mean ages in Groups 1 and 2 were 16.5 ± 22.8 versus 15.5 ± 18.8 months, respectively. The surgical procedure durations were 9.2 ± 1.7 and 15.4 ± 2.5 minutes in Groups 1 and 2, respectively ($p < 0.001$). Complications were found in 164 (19.7%) versus 81 patients (17.0%) ($p = 0.522$), including redundant skin in 42 (5.4%) versus 15 patients (3.14%) ($p = 0.105$) and major hemorrhage in 20 (2.4%) versus 15 patients (3.3%) ($p = 0.230$) in Groups 1 and 2, respectively.

Conclusion: Under local anesthesia, the circumcision procedure with the modified Mogen clamp can be performed more rapidly than with the dorsal slit, and the cosmetic results are better as the incision line is more regular. All postoperative complications were similar, with problems related to redundant skin occurring more frequently with clamp circumcision.

Keywords: Circumcision; Mogen clamp; Dorsal slit

1. Introduction

Circumcision has been the oldest and most ancient urological surgery performed worldwide for 5000 years. It has been performed for religious and traditional reasons for centuries, and its use has increased in this century due to the World Health Organization (WHO) recommendations for protection from sexually transmitted diseases (STDs), such as human immunodeficiency virus (HIV), syphilis, hepatitis B/C, herpes, and genital warts. Additionally, circumcised men have lower rates of penile cancer and urinary tract infections, while the partners of these men are reported to have lower rates of cervical cancer.^[1]

The WHO recommends circumcision before the sexually active period to protect against STDs in HIV high-burden countries. Research on AIDS has reported that circumcised men may be protected from this disease at a rate of up to 60%. Additionally, circumcision leads to significant savings linked to care and treatment costs due to HIV, along with other infective causes.^[2]

There are hundreds of circumcision methods to date. However, the WHO Manual of Male Circumcision recommends 3 adult techniques and 4 pediatric procedures under local anesthesia. For adults, the dorsal slit, forceps-guided, and sleeve resection methods are recommended, while the Plastibell technique, Mogen and Gomco clamps, and the standard surgical dorsal slit procedure are recommended for the pediatric age group.^[3]

Each method has its own advantages and disadvantages. The dorsal slit, sleeve resection, and forceps-guided methods require more surgical time and expertise than the Plastibell, Mogen, and Gomco clamping methods. In contrast, learning and performing the clamping and Plastibell methods are easier, and the surgical duration is shorter.

The dorsal slit method has a shorter surgical duration than sleeve circumcision, and glans and urethra complications are very low, as the glans penis can be easily seen during the procedure with both methods. However, more cosmetic disorders were noted later, as via the dorsal slit method it is not possible to cut the prepuce skin completely symmetrically.^[4] Owing to the incompatibility between sections of the Gomco clamp, there is a glans penis laceration risk. The Mogen clamp involves risks like total or partial amputation of the glans penis and leaving too much/too little foreskin, while Plastibell migration may cause necrosis of the glans.^[5,6]

As with circumcision methods, the person who performs circumcision is important. In some geographies (especially sub-Saharan Africa, East-West African countries, and Pakistan), circumcision is still traditionally performed by traditional unskilled hands and

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those who are not professional health workers. As a result, complications are more frequent after circumcisions are performed by those who do not know the anatomy of the penis and foreskin and those who do not follow a sterile technique. Currently, urologists and pediatric surgeons perform circumcision surgery or trained male and female nurses in developed countries.

2. Materials and methods

2.1. Patients

We retrospectively evaluated circumcised patients from 2013 to 2017 in a single clinic by a single surgeon using a modified Mogen clamp (Fig. 1) inspired by the original Mogen clamp and the conventional dorsal slit method. Hypospadias, buried penises, and patients with bleeding disorders were excluded from the study. Neonates, infants, and children with intact prepuces requiring circumcision for religious or cultural reasons or with medical indications for circumcision, such as phimosis, paraphimosis, and balanoposthitis were included in the study.

Group 1 comprised patients who were circumcised with the modified circumcision clamp (Fig. 1, 2, 3), whereas Group 2 comprised patients circumcised with the conventional dorsal slit method. Groups 1 and 2 included 832 and 477 patients, respectively. The patients' age, surgery duration, minor hemorrhage (patients with buffer or clotting solution used but not requiring postcircumcision suture or repeated surgical exploration), major hemorrhage (hemorrhage requiring suture or exploration), residual redundant prepuce skin, revision numbers, and family satisfaction values were recorded, and the 2 groups were compared. To measure family satisfaction, we used a scale ranging from 0 to 10 (0 = dissatisfied, 10 = full satisfaction).

2.2. Surgical procedure

First, detailed anamnesis of the prenatal and postnatal periods was obtained from families to determine diseases that may present an obstacle to surgical procedures, such as bleeding diathesis and hypospadias or diseases requiring prophylactic antibiotic use before circumcision (infective endocarditis and heart valve disease). Children underwent a physical examination to determine whether there were any problems that would prevent the circumcision procedure (hypospadias) or involve other urologic complications (undescended testis+ hernia, congenital chordee, or buried penis). Children with no problems in detailed anamnesis and physical examination had complete blood counts and coagulation factors examined before circumcision with local anesthesia. Children with the previously mentioned problems either did not undergo circumcision or had it performed after the resolution of the problems. All the procedures were performed by a single surgeon under aseptic conditions (sterile devices, gloves, drapes, and swabs). For local anesthesia,

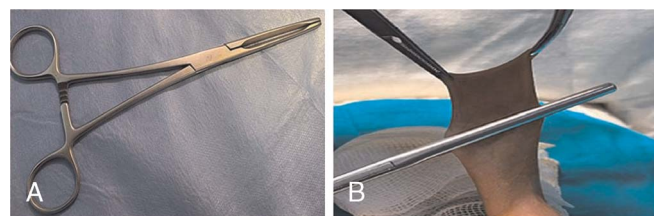


Figure 1. A and B: The modified Mogen clamp.

Jetocaine (lidocaine hydrochloride 20mg/mL, epinephrine hydrochloride 0.0125 mg/mL), and Marcaine (bupivacaine hydrochloride 5 mg/mL) were mixed with 1 mL of Jetocaine + 4 mL of Marcaine and applied in a ring to the root of the penis. Subdermal injection was performed to allow the skin to swell slightly, and not all of the mixture was injected in to the small penises. Children administered with local anesthesia were waited for 20 minutes for the effect of anesthesia to fully settle.

Physiological adhesions were freed from between the glans and prepuce, and smegma accumulation was cleaned. For circumcisions using the modified Mogen clamp, first, the prepuce skin was raised anteriorly and posteriorly with two mosquito clamps, and the glans were protected and inserted into the hollow in the clamp. Next, the modified Mogen clamp was closed, and the prepuce skin remaining above the clamp was excised with a no. 10 lancet. Subdartos open vein ends were cauterized with bipolar cautery, and the mucosa was joined using 5/0 Vicryl sutures. For the conventional dorsal slit, the prepuce was held bilaterally and from the posterior with three mosquito clamps, while the surgeon excised the prepuce skin with scissors, ensured hemorrhage control, and joined the mucosa and skin. After circumcision, the wound was wrapped with a gauze bandage, and the parents were informed about problems they may encounter at home (how to deal with dressing, bleeding, and signs of infections) and when to attend the hospital in emergency situations.

2.3. Follow-up and evaluation

On postoperative 1st day, 7th day, and 30th day, patients were evaluated in the clinic. During the visits, parents were questioned regarding the occurrence of complications. The surgeon performing the circumcision inspected the circumcision field and performed the physical examination.

2.4. Statistical methods

SPSS (version 22.0; Chicago, IL) was used with variables in the groups assessed with the independent t test, and statistical significance was set at $p < 0.05$. Correlations between redundant skin/revision and redundant skin/preputial stenosis were determined using Pearson's correlation analysis ($r > 0.7$, strong correlation), and statistical significance was set at $p < 0.01$.

3. Results

The modified Mogen clamp group (Group 1) comprised 832 patients, whereas the dorsal slit group (Group 2) comprised 477 patients. In Groups 1 and 2, the mean ages were 16.5 ± 22.8 and 15.5 ± 18.8 months ($p = 0.560$), respectively. The mean surgery durations were 9.20 ± 1.75 and 15.4 ± 2.5 minutes ($p < 0.001$), respectively. Minor hemorrhage occurred in 54 (6.5%) and 27 (5.6%) patients, respectively, and major hemorrhage in 20 (2.4%) and 15 (3.3%) patients, respectively ($p = 0.230$). Redundant skin was present in 42 (5.04%) and 15 (3.14%) patients ($p = 0.105$), stenosis in 19 (2.3%) and 11 (2.3%) patients ($p = 0.979$), adhesion in 15 (1.8%) and 7 (1.4%) patients ($p = 0.267$), revision in 36 (4.3%) and 15 (3.1%) patients ($p = 0.288$), infection in 14 (1.7%) and 6 (1.3%) ($p = 0.688$) patients, family satisfaction in total was 8.20 ± 1.47 and 8.16 ± 1.22 ($p = 0.358$), incision line regularity was 85% and 67% ($p < 0.001$), and family satisfaction in children with revision was 3.39 ± 1.12 and 3.60 ± 1.12 , respectively ($p = 0.569$) (Table 1).

Pearson's correlation analysis showed correlations between redundant skin/revision and redundant skin/preputial stenosis. The r , r^2 , and p values were 0.718, 0.515, and < 0.001 , and

Table 1
Comparison of demographic characteristics and complications.

	Modified Mogen clamp (n = 832)	Dorsal slit (n = 477)	p
Age, mo, mean ± SD	16.5 ± 22.8	15.5 ± 18.8	0.56
Cause of circumcision, n (%)			0.25
Cultural/religious	790 (95.0%)	438 (91.8%)	
Medical (e.g. phimosis)	42 (5.0%)	39 (8.2%)	
Total complications, n (%)	164 (19.7%)	81 (17%)	0.52
Minor bleeding, n (%)	54 (6.5%)	27 (5.6%)	0.87
Major bleeding, n (%)	20 (2.4%)	15 (3.3%)	0.23
Redundant skin, n (%)	42 (5.1%)	15 (3.1%)	0.11
Stenosis, n (%)	19 (2.3%)	11 (2.3%)	0.98
Adhesion, n (%)	15 (1.8%)	7 (1.4%)	0.27
Revision, n (%)	36 (4.3%)	15 (3.1%)	0.29
Infection, n (%)	14 (1.7%)	6 (1.3%)	0.69
Operation time, min, mean ± SD	9.2 ± 1.8	15.4 ± 2.5	<0.001
Incision line, n (%)			<0.001
Regular	707 (85.0%)	322 (67.5%)	
Non-regular	125 (15.0%)	155 (32.5%)	
Family satisfaction, mean ± SD			
Total	8.2 ± 1.5	8.0 ± 1.2	0.19
Revision patients	3.4 ± 1.2	3.6 ± 1.1	0.57

0.944, 0.890, and <0.001, for Groups 1 and 2, respectively (Table 2; Fig. 2 and 3).

4. Discussion

Circumcision is currently the most commonly performed urological surgical method in children worldwide. At the same time, it is the oldest surgery in world history performed for traditional and religious reasons for centuries. To date, various methods and tools have been developed to simplify circumcision procedures. The dorsal slit and surgical circumcision are the common surgical methods. In addition to these classic methods, many circumcision methods and devices have been developed; however, at present, the WHO pre-qualifies only 3 (Gomco clamp, Mogen clamp, and Plastibell) tools to make circumcision easier.

The classic sleeve circumcision and dorsal slit methods are the gold standard methods with proven adequacy^[7,8] However, in our country, these methods are not practical when performed in procedure rooms or under local anesthesia for religious and traditional reasons with family members. We felt the need to develop tools or clamps to perform the local circumcision procedure in our clinic in a more rapid, practical, and problem-free manner. Therefore, inspired by the Mogen clamp, we began to use the circumcision clamp that we designed and manufactured. Here, we aimed to provide a regular circumcision incision line to avoid harming the glans penis and urethra, to cut the

Table 2
Correlation analyses.

	r	r ²	p
Redundant skin/preputial stenosis	0.7	0.5	<0.001
Redundant skin/revision	0.9	0.9	<0.001

r > 0.7 indicates a strong correlation.

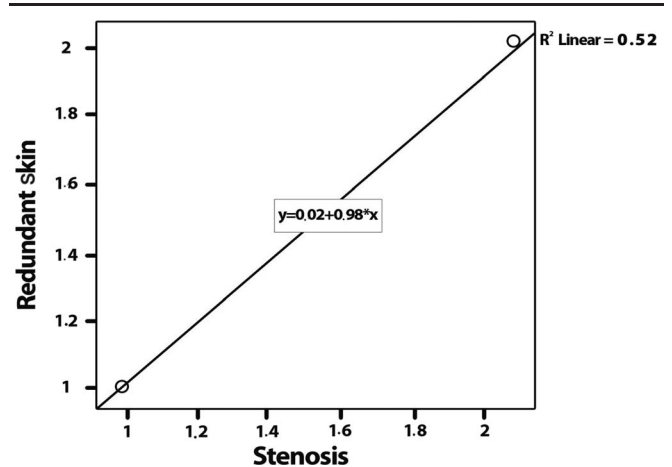


Figure 2. Pearson correlation analysis between redundant skin and stenosis.

prepuce with fully appropriate measurements, and to perform the surgery in a shorter duration than with the dorsal slit method. In line with this aim, we used our circumcision clamp for nearly all circumcisions performed after 2015.

Our circumcision clamp was inspired by the classic Mogen clamp and is based on a large hollow with atraumatic edges in the center, which keeps the glans penis away from or outside the surgical field. It was very simple to learn and perform the circumcision procedure using our modified circumcision clamp. After the prepuce was compressed in the clamp, we tested whether the glans penis underneath was free. However, we experienced problems with infants and children with small glans, and we were careful not to harm the glans while cutting the prepuce. To date, we have not observed glans amputation during circumcision with our modified clamp.

Apart from the difference in regularity of the incision line, there was no statistical difference in terms of complications between the classic dorsal slit and modified Mogen clamp methods. However, the duration of surgery was shorter with the modified Mogen clamp method, which may be due to the clamp alone or the surgeon completing the learning curve for the operation. Children in the adolescent age group are generally anxious during circumcision with local anesthesia, while younger infants may

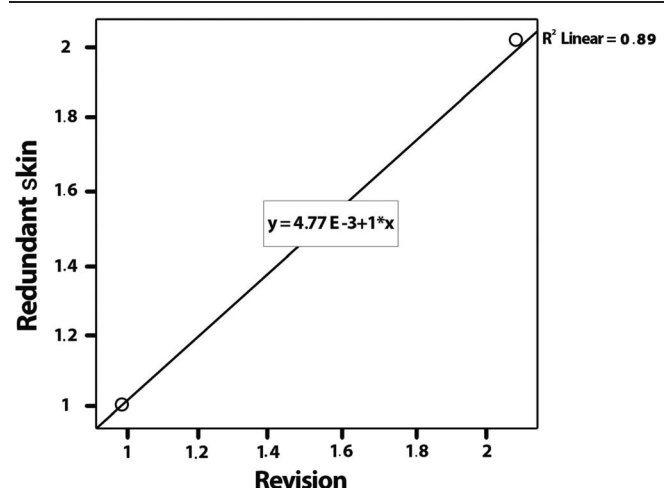


Figure 3. Pearson correlation analysis between redundant skin and revision.

have crying fits due to discomfort from being held still and the continuation of circumcision. As a result, every method that saves the surgeon's time is valuable for circumcision surgery. Kankaka et al.^[9] reported surgical procedure durations similar to our modified clamp for circumcision using the classic Mogen clamp, with a mean circumcision duration of 10.5 minutes.

Another advantage of the clamp is that the incision line is cosmetically more regular, and families are especially meticulous about this symmetry after circumcision. There was greater dissatisfaction with skin symmetry from families of children who underwent circumcision using the dorsal slit method.

The most disadvantageous aspect of the clamp is that the prepuce may be cut deficiently or redundant tissue may remain, although this was not statistically significant. Children with redundant tissue had more skin adhesions, bridges, and preputial stenosis, and more revision surgeries were performed. In parallel, Pearson correlation analysis showed strong correlations between redundant prepuce tissue with preputial stenosis and circumcision revision. Redundant prepuce also increases the risk of HIV and similar STDs, and decreases the protection of circumcision against these diseases. In the literature, in parallel with our study, it is shown that circumcision with Mogen and Gomco clamps generally leaves more excess prepuce skin compared to other methods.^[6,9,10] The authors reported that determining the incision line with a marking pen before compressing the prepuce with the Mogen clamp prevented this complication. The family satisfaction of the patients requiring this revision was naturally lower.

After circumcision with Mogen clamps, moderate and severe circumcision complications vary according to the surgical competence of the person performing the circumcision and are reported at rates of 1.6%–12.6%.^[9,11] After Mogen clamp circumcision, complications, such as minor and major hemorrhage and edema, were similar to those of other methods. However, redundant prepuce skin, skin bridges and adhesions, and glans penis amputation are higher with Gomco and Mogen clamp circumcisions than with classic dorsal slit, sleeve circumcision, and Plastibell methods.^[5,12] Despite this, circumcision is frequently performed with Mogen and Gomco clamps in the present day.^[2]

Studies comparing circumcision performed with the Plastibell and Mogen clamps reported that circumcision with Mogen clamp was less painful, more comfortable, and had a shorter procedure duration^[13] and the risk of migration and retention with the Plastibell and Mogen clamps were more reliable.^[6] After circumcision with Gomco and Mogen clamps, revision and complication rates were found to be similar; however, the Gomco clamp comprising several pieces was reported to be a disadvantage.^[6]

Studies have reported that minimal hemorrhage complications requiring the use of compression or topical thrombin are greater with Gomco than with Mogen clamps.^[10] Freeman et al.^[14] reported that the Plastibell method had the highest family satisfaction due to the cosmetic appearance after circumcision.

After circumcision with Mogen clamp, maternal satisfaction was 99.6%–100%.^[5] Similar rates were observed for circumcisions using the Gomco clamp.^[15]

Using the circumcision clamp in infants and children with a small glans penis increased our concerns as surgeons, and it was repeatedly checked that the glans remained on one side of the clamp in uncertain situations. Performing circumcision under local anesthesia quickly and removing the child from the table early are important, but these procedures should not be performed if the surgeons are uncertain; moreover, repeatedly checking the glans after placing the clamp is better compared to dealing with problems, such as partial or total glans penis necrosis.

The Plastibell circumcision device was included in the circumcision field after these 2 clamps. In contrast to the others, no incision was made. The device was placed on the glans penis and tied to the foreskin with the aid of a thread, which was expected to fall off with the foreskin. However, this device is not 100% flawless. In some patients, proximal loss causing glans necrosis and more hemorrhage from the frenulum has been reported,^[5] while case reports include intraperitoneal bladder rupture after urethral obstruction.

In conclusion, although circumcision is the most frequently performed surgical procedure in the world since the historical times, the best method to perform this surgery is still unclear. There is no gold standard method for circumcision. Circumcision should be performed by an experienced medical practitioner, with whichever method is easily performed and is superior. In our clinic, there is no method that is as comfortable as our circumcision clamp, and we will continue to use the same method in light of the outcomes from the last 4 years.

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Statement of ethics

According to our local institutional regulations, this study does not require ethics committee approval and participants' consent. All procedures performed in study involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Conflict of interest statement

The author declares no conflict of interest.

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Author contributions

Not applicable.

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