

# Reliability of thermocautery-assisted circumcision: retrospective analysis of circumcision performed voluntarily in countries of low socioeconomic status

Basri Cakiroglu<sup>ID</sup>, Ali Gozukucuk, Ersan Arda and Tuncay Tas

## Abstract

**Objective:** The objective of this study was to evaluate the reliability of thermocautery-assisted circumcision performed voluntarily in patients of poor countries.

**Material and methods:** Between 2016 and 2019, 32,000 children aged 7 days to 17 years were circumcised in multiple countries. The patients' urological examinations were done before the administration of local anaesthesia. Patients revealed to have undescended testicle, inguinal hernia, hypospadias, varicocele, penile rotation anomaly, epispadias and infection were not circumcised. All procedures were performed under local anaesthesia by using thermocautery. Afterwards, mucosa and skin were sutured using absorbable suture and the circumcised penis was dressed. Patients were instructed to remove the dressing after 3 days.

**Results:** Bleeding, requiring surgical intervention and drug reactions were not observed. The most observed complication was mucosal oedema, which occurred in approximately one-quarter of patients (26%, 8320/32,000) and continued for 3–5 days after the surgery. The most serious complication was a trapped penis, which occurred in 25 patients (0.078%). In six (0.018%) cases, meatal stenosis developed. Wound infection developed in only 10 (0.03%) cases, through the formation of an aseptic environment. Penile adhesion was seen in 35 cases (0.1%) and improved with anti-inflammatory treatment without any surgical intervention.

**Conclusion:** Thermocautery-assisted circumcision can be used as an effective, safe and useful technique with few complications and rapid healing rates.

**Keywords:** circumcision, thermocautery, bleeding, urinary system infection

Received: 21 June 2019; revised manuscript accepted: 22 September 2019.

## Introduction

Circumcision is a common surgical procedure that has been applied for thousands of years, and has been detected in 6000-year-old mummies.<sup>1</sup> The operation excises the prepuce and reveals the glans. There are certain indications for circumcision, specifically recurrent balanitis and pathological phimosis.<sup>2</sup> In some societies, circumcision is applied for preventing venereal diseases and/or in response to emergencies like phimosis/paraphimosis. It decreases the risk of urinary system infections, penile cancer, prostate cancer, cervical cancer, human papilloma virus,

herpes simplex virus type 2, human immunodeficiency virus and other venereal diseases.<sup>3</sup> However, it is also included in the religious practices of Muslims and Jews.<sup>4,5</sup>

Circumcision should be performed under appropriate conditions, which it may not always be possible to ensure, especially in poor countries. The surgical procedure and use of different energy sources can affect complication rates and the length of the healing period. There is some debate on the ideal procedure for circumcision. However, in recent years it has been shown that

*Ther Adv Urol*

2019, Vol. 11: 1–6

DOI: 10.1177/  
1756287219882598

© The Author(s), 2019.  
Article reuse guidelines:  
sagepub.com/journals-  
permissions

Correspondence to:

**Basri Cakiroglu**  
Department of Urology,  
Hisar Intercontinental  
Hospital, Saray Mah,  
Siteyolu Cad.No.7–9,  
İstanbul 34768, Turkey  
[drbasri@gmail.com](mailto:drbasri@gmail.com)

**Ali Gozukucuk**  
Department of  
Pediatric Surgery, Hisar  
Intercontinental Hospital,  
İstanbul, Turkey

**Ersan Arda**  
Medical Faculty,  
Department of Urology,  
Trakya University, Edirne,  
Turkey

**Tuncay Tas**  
İstanbul Cerrahi Hospital  
Department of Urology,  
Esenyurt University,  
İstanbul, Turkey



thermocautery is a cheap and practical method, and it has become more popular.<sup>6</sup> The aim of the present study was to evaluate the effectiveness and safety of thermocautery-assisted circumcision performed voluntarily in countries of low socioeconomic status.

### Material and methods

This study was carried out in accordance with the Helsinki Declaration and with the approval of the local ethics committee (Ethics Committee of Hisar Intercontinental Hospital, 2 March 2017, 2017/3-52). The data of patients who were circumcised in different countries between the years 2016 and 2019 were retrospectively retrieved and included in the study. Patients who had comorbid diseases, such as undescended testis, inguinal hernia, hypospadias, juvenile varicocele, penile curvature, penile rotation anomaly, epispadias, acute infection and bleeding diathesis, were excluded. The procedures were performed in Mauretania (2000 children in a 7-day programme in March 2018), Sudan (1200 children in a 5-day programme in April 2019), Uganda (1000 children in a 4-day programme in December 2018), Gambia (800 children in a 4-day programme in February 2019), Senegal (2000 children in a 6-day programme in March 2016 and 500 children in a 3-day programme in March 2018), Mali (700 children in a 4-day programme in February 2017 and 700 children in a 3-day programme in February 2018), Guinea (700 children in a 4-day programme in February 2017 and 700 children in a 4-day programme in April 2018), Benin (1200 children in a 5-day programme in July 2016), Madagascar (1500 children in a 5-day programme in May 2017), Kenya (2000 children in a 7-day programme in December 2017), Malawi (1500 children in a 5-day programme in August 2018), Chad (1750 children in a 5-day programme in November 2018), Afghanistan (1500 children in a 4-day programme in September 2016, 1750 children in a 5-day programme in April 2017 and 1500 children in a 4-day program in April 2019), Mongolia (2500 children in a 7-day programme in July 2017), Kirghizia (1200 children in a 4-day programme in September 2016, 1250 children in a 4-day programme in April 2017 and 1500 children in a 7-day programme in April), Indonesia (850 children in a 3-day programme in December 2018) and the Philippines (1700 children in a 7-day programme in April 2018). The patients were recorded by local voluntary agencies before

the date of circumcision. The labels consisted of the following sections: name, surname, birth date, birthplace and previous disease.

All patients were examined prior to circumcision. All cases were performed by one paediatric urologist and six medical assistants. As local anaesthetic, 40 mg of lidocaine HCl and 0.025 mg of adrenaline (Jetocaine ampule, Adeka, Turkey) was used. Penile block was applied to the radix penis and girth of the penis; 2–8 ml of local anaesthetic was administered according to the patients' age, weight and penis length. Routinely, the penis was cleaned with batticon and covered with a sterile surgical cover. At 15 min following local anaesthesia injection, the preputium was retracted to prevent glans injury and the process was started, after observing and cleaning the external meatus and glans. The preputium was held using two clamps at position 6 and 12 o'clock to create a slight strain and arrange the length of mucosa-circumcised skin. It was placed obliquely at an angle close to 15–20°, with its ventral part facing upwards. Thus, the meatus and frenulum were protected from injury. The skin was held and stabilized on the anterior and posterior sides by the clamp and preputial tissue was cut just above the clamp (Figure 1(a)–(d)) using a thermocautery device (MediGare TM 802-B; Thermo Medical, Istanbul, Turkey; Figure 2). The settings of the thermocautery device were established according to the patient's age: 500°C was used for patients under 2 years of age; 550–650°C was used for patients of 2–10 years of age; and 700–750°C was used for patients older than 10 years of age.

After bleeding was controlled, mucosal coherence in patients under 2 years of age was provided with two 5/0 absorbable sutures at 6 and 12 o'clock positions. A 4/0 absorbable suture was used in patients aged 2–10 years of age, with four sutures at 3, 6, 9 and 12 o'clock positions. Finally, in patients older than 10 years of age, 3/0 absorbable suture was used, with six sutures positioned at 2, 4, 6, 8, 10 and 12 o'clock. Afterwards, the wound was dressed with a bandage including nitrofurazone (Furacin 0.2% balm, Zentiva, Istanbul, Turkey). Patients were observed for 1 h postoperatively and painkillers were prescribed before discharge.

Observation time of patients was 1 week. The first follow up was performed by the surgery team, where the wound dressing was removed 3 days after the surgery and a return to routine daily life



**Figure 1.** Surgical steps of thermocautery circumcision.



**Figure 2.** Thermocautery device.

was advised. The next follow up was carried out by local assistants and health volunteers who

recorded and notified the outcomes and long-term complications.

### Results

Patient ages ranged between 7 days to 17 years. Circumcision was not performed in 1042 of 33,042 children who applied due to comorbid diseases (Table 1). Complications were evaluated according to the modified Clavien–Dindo classification method (Table 2).

The most frequently observed complication was mucosal oedema, which occurred in approximately one-quarter of patients (26%, 8320/32,000) and continued for 3–5 days after the surgery. No patient had any syncope or epileptic seizures related to local anaesthesia; furthermore, no

**Table 1.** Associated genitourinary anomalies.

Country ( <i>patients</i> )	Hipospadias	Inguinal hernia	Hydrocele	Varicocele	Undescended testicle	Rotation anomaly
Mongolia (2545)	20	5	5	2	13	
Kirghizia (4040)	25	15	25	2	18	5
Philippines (1763)	5	20	15	15	8	
Madagascar (1568)	10	30	5	8	10	5
Kenya (2099)	8	50	15		18	8
Malawi (1553)	5	20	12	2	5	10
Mauretania (2095)	20	30	20		15	10
Senegal (2559)	20	10	5	4	15	5
Guinea (1444)	7	15	5	2	12	3
Mali (1432)	5	5	10	3	4	5
Benin (1238)	10	10	5	4	8	1
Uganda (1021)	5	3	5		7	1
Gambia (826)	5	5	5	5	5	1
Chad (1784)	6	6	5	1	15	1
Indonesia (891)	10	10	2	4	10	5
Sudan (1309)	15	50	15	4	20	5
Afghanistan (5874)	40	20	25	4	30	5

**Table 2.** Thermocautery circumcision complication rates.

Complication	Number of patients	Percentage
Minor bleeding	730	2.2
Cautery burn	20	0.06
Trapped penis	25	0.078
Meatal stenosis	6	0.018
Wound infection	10	0.03
Penile adhesion	35	0.1
<b>Total</b>	<b>826</b>	<b>2.486</b>

bleeding requiring surgical intervention or drug reactions was observed in any of the patients. Perioperative minor bleeding due to frenular

artery or superficial dorsal veins was observed in 730 patients, but this was controlled by cauterization intraoperatively. Frenular injury was observed, but was surgically repaired and patients recovered completely. No glans injury or amputation was observed; however, thermocautery burn without tissue loss was determined in 20 patients (0.06%). The most serious complication was trapped penis in 25 cases (0.078%), which developed secondary to phimosis as a result of circumcision. Patients who had to have insufficient resection after the first operation underwent a second procedure. In six (0.018%) cases, meatal stenosis occurred. In 10 (0.03%) cases, wound infection developed through the formation of an aseptic environment. Patients with wound infection were given topical antibiotics, and their wounds were completely healed. Penile adhesion was seen in 35 cases (0.1%) and improved with anti-inflammatory treatment without any surgical intervention.

## Discussion

During or after circumcision, different complications can arise, such as bleeding, glans amputation and glans necrosis. These results can differ depending, on which method or energy source is used, as well as the surgeon. The complication rate reported in developed countries is low.<sup>7</sup> Unfortunately, in underdeveloped or undeveloped countries, most circumcision operations are performed by local traditional barbers, drummers and health technicians. Therefore, complication rates are unreported. Various studies on different circumcision methods are defined in the literature, but researchers are still debating the most convenient circumcision age and safest circumcision method.

The bipolar type of electrocautery method is a safe way to control the bleeding in circumcision. However, cautery can damage the penile veins if not used properly. Penile gangrene cases caused by monopolar electrocautery have been reported in our country.<sup>8</sup> It has been found that thermocautery is a safe method for circumcision if it is conducted by capable doctors;<sup>9</sup> yet, there have been relatively few studies about the use of thermocautery in circumcision.<sup>10–14</sup> The device we used is a modified version of other cautery devices. It includes a safety button and configurable heat level. This makes our device more secure than others. The heat level can be set at the minimum for young patients to decrease risk of tissue injury. It can be set to higher temperatures for older patients because their skin is thicker than that of younger patients.

Generally, complications are determined by the experience of the surgeon, the environment and technical factors; wide ranges of complication rates have been reported (0.1–35%); such complications include bleeding, simple infections or death.<sup>15–17</sup> In the literature, the most common reported complication is bleeding (2–35%),<sup>18</sup> mostly derived from the frenular or dorsal veins.

In a study carried out in England, 66,519 circumcisions were reported, with a complication rate of 2%. Complications were haemorrhage in 533 patients (0.8%), need for a revision in 303 patients (0.5%) and meatus stenosis in 7 patients.<sup>19</sup> In another study in which, similar to our own, lidocaine/adrenaline was applied as a local anaesthetic and electrocautery was used, the bleeding rate was reported as 0.05%. It was emphasized that using this combination of anaesthetic decreases

the bleeding rate, which is in accordance with and supported by our findings.<sup>10,18</sup> Different to these results, in our study, the most commonly observed problem was mucosal oedema, which was seen in one-quarter of the patients. We believe that mucosal oedema is a commonly observed but unheeded complication in thermo- or electrocautery-assisted circumcision.

To date, few data on thermocautery-assisted circumcision have been reported. However, in the study by Arslan and colleagues,<sup>10</sup> oedema occurred in one-fifth of patients, which was identified as clinically unimportant.

Ngcobo and colleagues<sup>20</sup> reported that 30% of patients experienced penis swelling on the second day after surgery, which was a slight higher rate than in our findings; however, the surgical procedure was not made clear. Additionally, the bleeding rate was higher than in previously reported studies.

Complications like glandular amputation, cautery burns, poor wound healing, infection, stenosis of the meatus, necrosis and urethral fistula were rarely observed rarely.<sup>13,19,21</sup> In the present study we did not observe glandular or penile amputation. Frenulum injury was observed in 1.57% of patients, but was resolved with treatment. In addition, glandular burn was encountered in 20 patients (0.06%). Topical treatment was provided for 1 week, but variable scar tissue developed. Wound recovery, after thermocautery-assisted circumcision, is reported to occur in 1 week.<sup>14</sup> Similarly, we observed that healing started by the fourth day after the operation, and total recovery occurred in 1 week.

## Conclusion

Thermocautery-assisted circumcision can be used as an effective, safe and useful technique with low complication and fast healing rates; however, further research in this area is need.

## Funding

The authors received no financial support for the research, authorship and/or publication of this article.

## Conflict of interest statement

The authors declare that there is no conflict of interest.

### Ethical statement

Ethics Committee of Hisar Intercontinental Hospital, 2 March 2017, 2017/2-52

### ORCID iD

Basri Cakiroglu  <https://orcid.org/0000-0001-5337-5226>

### References

- Dunsmuir WD and Gordon EM. The history of circumcision. *BJU Int* 1999; 83: 1–12.
- Rickwood AMK. Medical indications for circumcision. *BJU Int* 1999; 83(Suppl. 1): 45–51.
- Cao D, Liu L, Hu Y, *et al.* Systematic review and meta-analysis of circumcision with Shang ring vs conventional circumcision. *Urology* 2015; 85: 799–804.
- Polat F, Tuncel A, Balci M, *et al.* Comparison of local anesthetic effects of lidocaine versus tramadol and effect of child anxiety on pain level in circumcision procedure. *J Pediatr Urol* 2013; 9: 670–674.
- World Health Organization. *WHO/UNAIDS: Male circumcision – global trends and determinants of prevalence, safety and acceptability*. Washington, DC: World Health Organization, 2008.
- Tuncer AA and Değer M. Incidence of complications following thermocautery-assisted circumcisions. *Urol J* 2018; 4.
- Rizvi SA, Naqvi SA, Hussain M, *et al.* Religious circumcision: a Muslim view. *BJU Int* 1999; 83(Suppl. 1): 13–16.
- Uzun G, Ozdemir Y, Eroglu M, *et al.* Electrocautery induced gangrene of the glans penis in a child following circumcision. *BMJ Case Rep* 2012; 2012.
- Karaman Mİ, Zulfikar B, Ozturk M, *et al.* Circumcision in bleeding disorders: improvement of our cost effective method with diathermic knife. *Urol J* 2014; 11: 1406–1410.
- Arslan D, Kalkan M, Yazgan H, *et al.* Collective circumcision performed in Sudan: evaluation in terms of early complications and alternative practice. *Urology* 2013; 81: 864–868.
- Kazem MM, Mehdi AZ, Golrasteh KZ, *et al.* Comparative evaluation of two techniques of hemostasis in neonatal circumcision using the Plastibell device. *J Pediatr Urol* 2010; 6: 258–260.
- Tuncer AA, Bozkurt MF, Bayraktaroğlu A, *et al.* Examination of histopathological changes of scalpel, monopolar, bipolar, and thermocautery applications in rat experimental circumcision model. *Am J Transl Res* 2017; 9: 2306–2313.
- Karaman MI, Zulfikar B, Caskurlu T, *et al.* Circumcision in hemophilia: a cost-effective method using a novel device. *J Pediatr Surg* 2004; 39: 1562–1564.
- Tuncer AA and Erten EEA. Examination of short and long term complications of thermocautery, plastic clamping, and surgical circumcision techniques. *Pak J Med Sci* 2017; 33: 1418–1423.
- Pippi Salle JL, Jesus LE, Lorenzo AJ, *et al.* Glans amputation during routine neonatal circumcision: mechanism of injury and strategy for prevention. *J Pediatr Urol* 2013; 9: 763–768.
- Cathcart P, Nuttall M, Meulen JVD, *et al.* Trends in paediatric circumcision and its complications in England between 1997 and 2003. *Br J Surg* 2006; 93: 885–890.
- Patel H. The problem of routine circumcision. *Can Med Assoc J* 1966; 95: 576–581.
- Polat F, Tuncel A, Balci M, *et al.* Comparison of local anesthetic effects of lidocaine versus tramadol and effect of child anxiety on pain level in circumcision procedure. *J Pediatr Urol* 2013; 9: 670–674.
- Cathcart P, Nuttall M, Meulen JVD, *et al.* Trends in paediatric circumcision and its complications in England between 1997 and 2003. *Br J Surg* 2006; 93: 885–890.
- Ngcobo S, Wolvaardt JE, Bac M, *et al.* The quality of voluntary medical male circumcision done by mid-level workers in Tshwane District, South Africa: a retrospective analysis. *PLoS One*. 2018; 13: e0190795.
- Weiss HA, Larke N, Halperin D, *et al.* Complications of circumcision in male neonates, infants and children: a systematic review. *BMC Urol* 2010; 10: 2.