

A fast, sutureless, and bloodless male circumcision technique combining the Guillotine method and a hand tool electric soldering iron, as a method to prevent postcircumcision bleeding

Mohamed F. Abdelhalim

Department of General Surgery, Benha Faculty of Medicine, Benha University, Benha, Egypt

Correspondence to Mohamed Farid Abdelhalim, MD of General Surgery, Benha, Qalubia, 13511, Egypt. Tel: 01005004354; e-mail: faridsurgeon82@gmail.com, faridsurgeon@gmail.com

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Background

Sutureless male circumcision (MC) without fear of bleeding remains an unmet need for general surgeons, nonmedical traditional providers, and parents, but the bleeding rate is still high up to 35% of the circumcision complications, particularly with the excision methods. The use of devices in MC has been gaining attention to reduce postcircumcision bleeding and adverse events.

Objective

The objective of this study was to assess the safety, efficacy, and acceptability of the hand tool electric soldering iron in MC.

Participant and methods

During the period from August 2018 to June 2019, 331 male infants and children were recruited for circumcision. All the patients underwent circumcision with the Guillotine method but with trimming of the prepuce by the electric soldering iron.

Results

The study group included male children with a mean age of 21.8 ± 30.29 months (range: 0.0–120 months). The mean operative time was 6.45 ± 1.30 min (range: 5.0–9.0 min). The end results of this study were 0.0% postcircumcision bleeding, reduced healing time (mean: 7.37 ± 2.14 ; range: 5.0–14.0 days), and minimal adverse events.

Conclusion

Applying the electric soldering iron tool is safe, simple, and effective in MC without neither suturing nor fear of bleeding.

Keywords:

bleeding, circumcision devices, Guillotine method, male circumcision, soldering iron

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Introduction

Male circumcision (MC) is an ancient surgical procedure in the history of human beings [1]. The earliest records of MC stem from the Egyptian sixth dynasty [2]. It is commonly performed for religious and cultural reasons. In Islam, MC is considered as ‘Sunnah’ and is included in ‘Sharia’, so it is mandatory. In the Jewish faith, it is a commandment, and early Christianity dropped the practice of circumcision but did not condemn or prohibit it [2]. In Western countries, they adopted MC for its medical benefits [3]. These benefits of MC include the reduction of most sexually transmitted diseases such as HIV, HPV, HSV2, syphilis, and their sequelae. This protection, fortunately, involves both partners, as there is evidence for reduced penile warts, penile cancer, bacterial vaginosis, and reduced risk of cervix cancer [4]. MC can be undertaken at any age, but evidence-based recommendations entail circumcision at infancy as the ideal time [5]. Later circumcision necessitates general anesthesia and a standard operative room, which means high costs and also carries more adverse events (AEs) and

pain, with long healing time and low cosmetic outcome [6]. According to the WHO Manual of Male Circumcision, MC methods can be categorized into pediatric and adult methods. WHO adopted three adult methods: the forceps guided, the dorsal slit, and the sleeve resection techniques, and four pediatric methods: the plastibell, the Mogen and Gomco shield, and the dorsal slit procedure [7]. MC is a minor surgical procedure on a normal healthy male, so safety and low risk must be guaranteed [3]. Circumciser experience, method of circumcision, and patient-associated variables such as age all can affect outcomes of circumcision [1]. The estimated percentage of circumcised males for Egypt is 94.7% of the population [8]. Bleeding is one of the most common complications of circumcision, ranging from 0.1 to 35%.

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Its incidence is high with the excision methods including the Guillotine method [9].

Objective

The objective of this prospective case series study was to assess the safety, efficacy, and acceptability of the hand tool electric soldering iron in MC and introducing it as a safe, simple, and effective tool in this procedure.

Participant and methods

During the period from August 2018 to June 2019, 381 male infants and children presented to the General Surgery Department, Benha University Hospital, for circumcision. The complete blood counts and coagulation profiles were performed. Written consent was taken from each parent. The variables assessed were age, operative time, wound healing time, parental satisfaction, and AEs of circumcision, including postoperative pain, bleeding, infection, edema, hematoma, penile injury, wound dehiscence, and insufficient skin removal.

The study design was a prospective case series.

The inclusion criteria were uncircumcised males, with ages less than or equal to 10 years.

The exclusion criteria were anatomical and pathological abnormalities such as hypospadias, epispadias; known bleeding, and coagulation disorders. The children with minimal penile skin deficiency anomaly were not excluded like other overt anomalies, for example, hypospadias.

Follow-up visits

Follow-up visits were on days 2, 7, and 14.

Operative procedure

The operations were undertaken under local anesthesia for ages less than 1 year old and general anesthesia for ages above 1 year old.

The child was put in the supine position and the skin was prepared by povidone-iodine solution. Penile ring and dorsal nerve block using 1 ml of lidocaine (2%) was applied at the base of the penis (Fig. 1). The prepuce was retracted from the glans. The adhesions and the smegma were scrubbed (Fig. 2). The prepuce was replaced on the glans and was grasped at the 3-o'clock and 9-o'clock positions with mosquito clamps after traction of the inner preputial layer (Fig. 3). At the level of the penile corona, the glans was withdrawn by the thumb and protected by the bone cutting forceps. A heated soldering iron is used to remove the redundant prepuce distal to the bone cutting forceps (Fig. 4). The glans was bared and the wound was bandaged (Figs 5 and 6).

The electric soldering iron is a pen-like hand tool used in soldering, making jewelry, and creating arts and crafts [10]. It is composed of an electrically heated tip and an insulated handle [10]. It offers a temperature with a range from 150 to 450°C and 60 W of power. This allows it to heat up quickly and maintain precise temperatures [10]. We used temperature-controlled soldering iron tool of 220 Volt, 60 W, and temperature 450°C for MC (Fig. 7). The soldering iron is a cheap tool; it costs about 2\$ dollars and can be purchased from electrical shops.

To assess postoperative pain, we adopted numeric visual analog scale (VAS) for the children older than 6 years where 0 reveals no pain and 10 reveals the worst pain (Fig. 8). Evaluation *Enfant Douleur*

Figure 1



Penile ring anesthesia.

Figure 2



Retraction of the prepuce.

Figure 3



Grasping of the prepuce.

Figure 5



Baring of the glans.

Figure 4



Trimming by soldering iron.

Figure 6



Final penile appearance.

(EVENDOL) was applied for children younger than 6 years. EVENDOL score ranges from 0 to 15 and the treatment threshold is 4/15 (Table 1) [11].

Postoperative pain was alleviated with lidocaine spray (2%) and acetaminophen suppositories twice a day. Local antibiotic, fusidic acid cream, was applied on the wound twice a day for 2–3 days.

Statistical analyses

Software SPSS, Version 26.0, for Windows (SPSS Inc., Chicago, Illinois, USA) was used for the univariate, bivariate, and stratified analyses of the data. Qualitative variables were analyzed by constructing contingency tables with Pearson χ^2 test or Fisher exact test when conditions for the former were not met. Analysis of variance was used for multiple comparisons of quantitative variables. Differences were considered significant at *P* less than or equal to 0.05.

Figure 7



Temperature-controlled soldering iron.

Results

During the period from August 2018 to June 2019, 381 male infants and children presented to the General Surgery Department, Benha University Hospital, for circumcision. Their ages were less than or equal to 10 years. Overall, 211 (63.7%) males were less than or equal to 1 year old, 86 (26.0%) males were more than 1 to less than or equal to 6 years old, and 34 (10.3%) males were more than 6 to less than or equal to 10 years old. Ethical

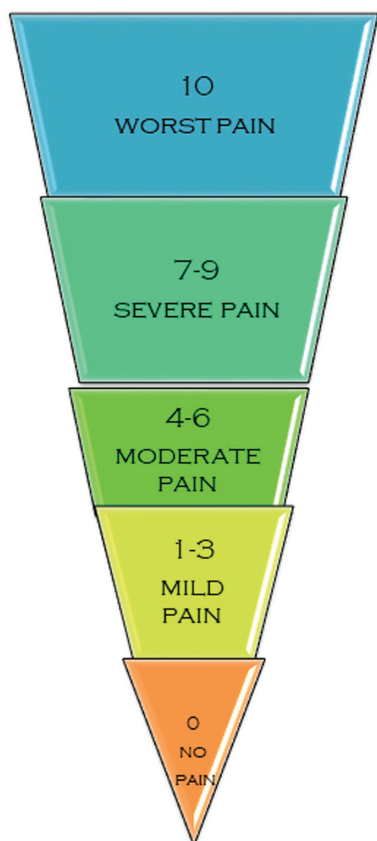
permission was approved by the Ethics Committee at Benha Faculty of Medicine. Written informed consent was taken from each parent after a full discussion about the circumcision method and the possible AEs. The mean operative time was 6.45±1.30 min, and the mean healing time was 7.37±2.14 days (Table 2).

A total of 25 (7.55%) cases exhibited postoperative AEs in the form of infection, edema, hematoma, and

wound dehiscence. The most common complication was infection (2.71%). The bleeding was insignificant intraoperatively, and there was no bleeding postoperatively (Table 3).

The pain was assessed 1, 2, and 24 h after circumcision using VAS for children older than 6 years. The EVENDOL pain scale was used to assess pain in children younger than 6 years. Parents were asked to determine their satisfaction with the circumcision procedure of their children either satisfied or unsatisfied; approximately 99.3% of parents were satisfied (Table 4). Age groups' differences were assessed regarding operative time, healing time, AEs, parent satisfaction, and pain scores (Tables 4 and 5).

Figure 8



Visual analog scale.

Discussion

Sutureless MC without fear of bleeding remains an unmet need for general surgeons, nonmedical traditional providers, and parents, but the bleeding rate

Table 2 Age, operative, and healing times

	n=331 [n (%)]
Age (years)	
≤1	211 (63.7)
1–6	86 (26.0)
>6	34 (10.3)
Mean±SD (range)	21.8±30.29 (0.0–120.0)
Median (IQR)	5.0 (2.5–30.0)
Operative time preparation (min)	
Mean±SD (range)	9.66±2.96 (6.0–15.0)
Operative time (min)	
Mean±SD (range)	6.45±1.30 (5.0–9.0)
Healing time (days)	
Mean±SD (range)	7.37±2.14 (5.0–14.0)

IQR, interquartile range.

Table 1 EVENDOL score for pain assessment in children less than or equal to 7 years old [11]

Behavioral expression	Sign absent	Sign weak or transient	Sign moderate or present about half the time	Sign strong or present almost all the time
Vocal or verbal expression				
Cries and/or screams and/or moans.	0	1	2	3
Facial expression				
Furrowed forehead and/or frown, furrowed brow and/or tense mouth	0	1	2	3
Movements				
Restlessness, agitation and/or rigidity	0	1	2	3
Postures				
Antalgic posture and/or protection of the painful area and/or immobility	0	1	2	3
Interaction with the environment				
Can be comforted and/or interested in playing and/or interacts with people	0	1	2	3

EVENDOL, Evaluation Enfant Douleur.

Table 3 Postoperative adverse events

Postoperative adverse events	
Infection	
Positive	9 (2.7)
Negative	322 (97.3)
Hematoma	
Positive	6 (1.8)
No	325 (98.2)
Edema	
Positive	8 (2.4)
Negative	323 (97.6)
Wound dehiscence	
Positive	2 (0.6)
Negative	329 (99.4)
Bleeding	
Positive	0
Negative	331 (100)
Penile injury	
Positive	0
Negative	331 (100)
More or less skin removal	
Positive	0
Negative	331 (100)

is still high up to 35% of the circumcision complications particularly with the excision methods [9]. WHO adopted four pediatric methods: the plastibell, the Mogen and Gomco shield, and the dorsal slit procedure [7]. Using devices in MC has been gaining attention. Devices abridge the circumcision procedure, censor the operation difficulty, and reduce its AEs [12]. Scale-up and rapid roll-out of MC have been lingered owing to conventional surgical techniques which necessitate cutting and suturing, with the disadvantages of long operation time and high rate of AEs. One of the most common conventional circumcision techniques is the forceps-guided technique (its modification is the Guillotine method using bone cutting forceps) [13,14]. In this study, we assess the clinical efficacy and safety of the hand tool electric soldering iron in MC using the Guillotine method and its role in the prevention of postcircumcision bleeding. Assessment includes safety (AEs and time of wound healing), efficacy (ease of use, duration of operation, operative difficulties), and acceptability (postcircumcision pain using VAS and EVENDOL scales and parental satisfaction) [13,15]. Infancy is the main time of circumcision of this study group, representing 69.4% of the cases. This indicates a growing public awareness of the benefit of circumcision in early life. Infant circumcision is a safe and simple surgery with advantages of rapid healing, excellent cosmetic results, cost-effective, and minimal AEs [5]. It also prevents early life recurrent urinary tract infection and its sequelae, balanoposthitis, phimosis, and paraphimosis [6]. Operative preparation time represented the time to

drape and local or general anesthesia, or both. It was short (the mean was 7.62 ± 1.26 min) in infants anesthetized with local anesthesia and quite long (the mean was $12.79 \pm .50$ to 14.44 ± 0.69 min) in children owing to time for general anesthesia. The mean operative time was 6.45 ± 1.30 min. This time is diminutive in comparison with the conventional Guillotine method using the scalpel for cutting, which dictates more time for suturing and careful hemostasis. Complete healing ensued within 1–2 weeks. Healing time in infants (6.23 ± 1.23 days) and children (10.88 ± 2.07 days) is swift attributable to age-associated variances in proinflammatory agents as well as proper coaptation of both inner and outer plates of the trimmed prepuce [16]. The AE rate was 7.55%. There were no severe complications; all were mild and rapidly relieved. A systematic review of 16 prospective studies on circumcision revealed AEs were up to 16% of circumcised males. The most common AEs were infection (1.5%) and bleeding (1.3%) [17]. In other studies, the incidence of circumcision wound infection was in 0.4–10% range. It oscillated from minor infection to severe morbidity, including necrotizing fasciitis, scalded skin syndrome, Fournier's gangrene, and septic shock [18]. Moreover, the postcircumcision bleeding ranges from 0.1 to 35%, which necessitated blood transfusion in some cases [3,19]. In our study, the infection was 2.71%. It was mild and resolved rapidly after the application of the topical antibiotic (fusidic acid, 20 mg). The incidence of bleeding was 0%, which is the most remarkable point of this study. This is attributable to the proper heat cauterization of the tissues, the trimming, and the firm adherence of both plates of the prepuce. Bleeding is the most appalling complication of circumcision; we believe it is no longer after using the soldering iron tool for MC. Penile hematomas (1.81%) were caused by syringe needle injury during local ring anesthesia. Penile edemas (2.41%) were mild. They were associated with infection and penile hematoma. Penile hematomas and edemas were resolved spontaneously. Wound dehiscence occurred in two older children; both had minimal penile ventral skin deficiency anomaly and were managed by suturing the wounds. In this study, other short-term complications such as penile injuries, more or less skin removal, or device-related complications did not exist, and long-term complications such as phimosis, urethral fistulae, and meatal stenosis were not befallen.

During the 20th century, there was a general concept of negation of neonatal and infant pain; consequently, most of the pediatric surgeries were undertaken with minimal or no anesthesia [20]. Although many studies have acknowledged that neonatal pain is associated with short-term and

Table 4 Age groups' differences regarding AEs, parental satisfaction, VAS score, and EVENDOL score

	Age groups [n (%)]			Statistical test (FET)	P value
	≤1 years (n=211)	1–6 years (n=86)	>6 years (n=34)		
Infection	5 (2.4)	3 (3.5)	1 (2.9)	0.70	0.68
Hematoma	3 (1.4)	2 (2.3)	1 (2.9)	1.27	0.53
Edema	4 (1.9)	2 (2.3)	2 (5.9)	2.27	0.32
Wound dehiscence	0	1 (1.2)	1 (2.9)	4.88	0.064
VAS first hour					
VAS 1–3			3 (8.8)		
VAS 4–6			26 (76.5)		
VAS 7–9			5 (14.7)		
VAS second hour					
VAS 1–3			8 (23.5)		
VAS 4–6			21 (61.8)		
VAS 7–9			5 (14.7)		
VAS 24 h					
VAS 1–3			29 (85.3)		
VAS 4–6			3 (8.8)		
VAS 7–9			2 (5.9)		
EVENDOL first hour					
Score 4–5	13 (6.2)	4 (4.7)		$\chi^2=0.56$	0.76
Score 6–10	176 (83.4)	71 (82.6)			
Score 11–15	22 (10.4)	11 (12.8)			
EVENDOL second hour					
Score 4–5	183 (86.7)	67 (77.9)		$\chi^2=5.14$	0.077
Score 6–10	16 (7.6)	14 (16.3)			
Score 11–15	12 (5.7)	5 (5.8)			
Satisfaction					
Yes	210 (99.5)	86 (100)	33 (97.1)	3.08	0.26
No	1 (0.5)	0	1 (2.9)		

AE, adverse event; EVENDOL, Evaluation Enfant Douleur; FET, Fisher exact test; VAS, visual analog scale.

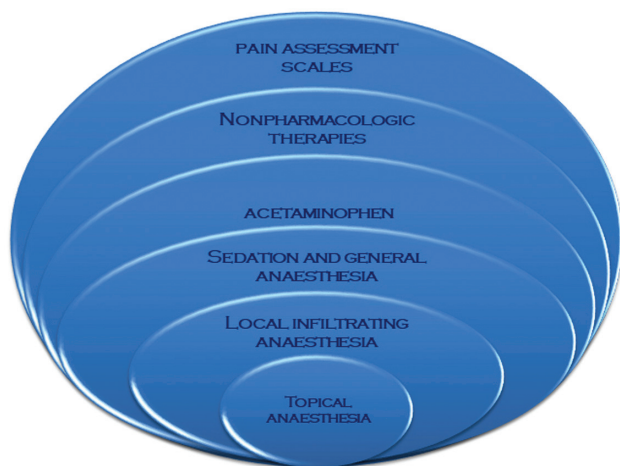
Table 5 Age groups' differences regarding operative time preparation/min, operative time/min, and healing time/days

	Age groups						Statistical test (F)	P value
	≤1 year (n=211)		1–6 years (n=86)		>6 years (n=34)			
	Mean	SD	Mean	SD	Mean	SD		
Operative time preparation (min)	7.62	1.26	12.79	0.69	14.44	0.50	1078	<0.001
Operative time (min)	5.62	0.70	7.64	0.48	8.59	0.50	525.6	<0.001
Healing time (days)	6.23	1.23	8.76	1.49	10.88	2.07	216.7	<0.001

long-term detriments, the infant circumcision is still performed without anesthesia by some healthcare providers [21]. Perioperative pain management caused by circumcision is essential for child safety, consistency, enhanced recovery, minimal AEs, and worthy parental satisfaction [22]. In this study, we adopted a comprehensive stepwise or tiered approach using nonpharmacologic and pharmacologic methods for circumcision pain relief (Fig. 9). During and after circumcision, we encouraged nonpharmacologic therapies in the form of oral sucrose, breast or bottle feeding, Kangaroo skin to skincare, massage, non-nutritive sucking, and sensorial saturation including tactile, auditory, and visual stimulation [23].

Topical anesthesia in the form of lidocaine spray was applied on penile skin before penile ring anesthesia using lidocaine [24]. The recommended dose is 3–5 mg/kg/dose of 0.5% (5 mg/ml) or 1% (10 mg/ml) lidocaine solution. For old infants and children, general anesthesia was the apt tier to attain optimal analgesia [25]. Acetaminophen is recommended for use in mildly to moderately painful procedures such as circumcision [26]. The total daily dose is 60–75 mg/kg/day. Rectal acetaminophen should be dosed at 20 mg/kg every 6–8 h [24]. Postcircumcision pain should be evaluated frequently to monitor the efficiency of interventions [27]. The Joint Commission for the Accreditation of Hospitals has considered the pain assessment is the fifth vital sign in all patients [28].

Figure 9



Tiered approach for circumcision pain management.

The age and perceptive development of the child affect the pain assessment [27]. Therefore, several validated pain scoring methods (>40) for children have been evolved [28]. The numeric 0–10 VAS is the most validated scoring method for verbal children older than age 6 years. For children younger than age 6 years, the EVENDOL scale is polyvalent, reliable, and has robust validity measures [11].

One hour after circumcision, 76.5% of the children experienced VAS 4–6 (moderate pain). After the administration of the analgesic (acetaminophen) and the lidocaine spray, 62% of the children experienced VAS 1–3 (mild pain). At 24 h after circumcision, more than 85% of the children experienced mild pain. Regarding EVENDOL score, 1 h after circumcision, 83.4% of the children experienced EVENDOL 6–10 (moderate pain). After the administration of the analgesic (acetaminophen) and the lidocaine spray, 86% of children experienced EVENDOL 4–5 (mild pain), and at 24 h after circumcision, all of the children experienced no pain.

Age at which circumcision is performed influences the outcomes of the procedure and incidence of AEs. AEs are more common in old children than newborns and infants [1]. In this study, Table 4 reveals overall AEs were common in old children; infection was seen in 2.9%, edema in 5.9%, and wound dehiscence in 2.9%. Table 5 reveals shorter times of operations and healing in neonates and infants than old children. These results support the outstanding benefits of early life circumcision.

One of the limitations of this study was the short-term follow-up, where some variables like cosmetic results and sexual satisfaction could not be assessed.

Conclusion

Applying the electric soldering iron tool is safe, simple, and effective in MC without neither suturing nor fearing of bleeding. It is easy to use in neonates, infants, and children, and it is cost-effective in health resource-limited settings.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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