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REVIEW ARTICLE

Early and late complications of male circumcision: a systematic review

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ABSTRACT

Background: Circumcision is the surgical removal of foreskin from the penis. It is one of the oldest procedures among male neonates, infants, and children. Different complications could result from it either in the early or later period of life. The aim of the current study was to determine the major early and late complications associated with male circumcision and to asses which group of individuals are at higher risk for the complications or who are at more risk.

Methodology: A broad medical literature search in PubMed, MEDLINE, Cochrane Library, and EMBASE was performed from July 30 to August 3, 2018. Prior to the literature search, all of the inclusion/exclusion criteria were well specified.

Results: This systematic review included seven articles of different study designs which were published between 2011 and 2017, and the articles were summarized under specific titles as follows: author and publication year, study design, number of patients and age, type of anesthesia used, technique used, personnel who performed the procedure, early and late complications, results, and conclusion.

Conclusion: Younger age and untrained personnel were associated with different complications associated with male circumcision in the Saudi population.

Keywords: Circumcision, late, early, complications.

Introduction

Circumcision is the removal of foreskin from the penis surgically [1]. It is the most performed procedure, as 30% of the world's men are circumcised [2]. The prevalence of circumcision among Muslims and Jewish is 100% [2]. Moreover, it is considered as one of the oldest procedures among male neonates, infants, and children, which has been done for religious, cultural, and medical causes [3]. It has been associated with different early and late complications. Early complications include bleeding and pain that can be treated after circumcision [3,4]. Serious complications developing at an early stage are very rare (4). Late complications include excessive skin removal, meatal stenosis, chordee, epidermal inclusion cyst, penile adhesions, and urethrocutaneous fistula which can be treated in outpatients setting [3–5]. Complications are more common when circumcision is done at an older age, or by untrained providers or in non-sterile setting [4]. However, the benefits of circumcision such as the prevention of sexually transmitted diseases (STD) and penile cancer may exceed the risks [6]. Many studies have been done to evaluate the adverse events of circumcision. In our study, we aim to summarize the early and late complications developed after circumcision was reported in the last 8 years and to find the most common complication of circumcision among the pediatric population.

Materials and Methods

A broad computer literature search in PubMed, MEDLINE, the Cochrane Library, and EMBASE was performed from July 30 to August 3, 2018, by seven reviewers to select studies that answer the questions of interest. Following search keywords were used for the systematic search (male, complication,

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adverse events, pediatric/child/newborn/infant, and circumcision) and free-text terms such as "male circumcision" or "male children circumcision" or "pediatric circumcision" or "infants circumcision" or "early male circumcision,' or "late male circumcision" combined with "complication" or "adverse effect." The PubMed database was searched using the following search term and Medical Subject Headings (MeSH) such as ("child"[MeSH] AND ("circumcision, male"[MeSH] or ("circumcision, male"[MeSH] AND "complication" or ("circumcision, male"[MeSH] and "late complication." In addition, there were no language limitations applied to the studies collected. The reference list of relevant studies was examined by extensive hand searching which also included a systemic review of male circumcision complications. Among the 30 published paper collected during the process, only seven were finalized for the systematic review.

Inclusion/exclusion criteria of studies were well defined for the present systemic review. The selection criteria included were as follows: The study should contain males who are aged between 3 months and 14 years and should undergo circumcision in a medical set-up. All the studies that contain cases of circumcision that had been done in a non-medical setting were excluded. Studies that included cases of a patient that had a medical condition which may worsen the procedure such as coagulopathy and cases that undergo a urogenital surgery in the early neonatal period were also excluded. Furthermore, studies that contain cases of congenital malformation like down syndromes for example and those who exposed to trauma in childhood were also excluded.

Results

This systematic review included seven articles of different designs which were published between 2011 and 2017, and we summarized the articles reviewed under specific titles as follows: author and publication year, study design, patients' number and age, type of anesthesia, technique used and personnel who performed the procedure, early and late complications, results, and conclusion (Table 1). There were two prospective studies [7,8], three retrospectives [9–11], one cross-sectional [12], and one case series [13]. The number of patients included in combining all the studies was 2,950, with an age range of 14 days to 14 years, the study population used in the articles review included neonates, infants, children, and adolescents. The type of anesthesia was not mentioned in three studies, two retrospective [9,10], and one prospective [8], topical, local, and general anesthesia was performed in one [12], one [13], and two studies [8,10], respectively. The most common method of circumcision used was using Plastibell, which was used in three studies [8,11,12], the other three studies mentioned classic method [9], surgical procedure with caudal block [10], and minor surgical procedure [13], whereas one study did not mention the method at all [7]. Different personnel performed circumcision in different studies; in one study [9], traditional circumcisers were the most common personnel performing circumcision (80.83%), another study reported medical officers and surgical residents [12]. Furthermore, in another study [7], nurses were the most common personnel reported performing circumcision (84.4%), one study [8] reported one surgeon, one study did not mention the person at all [10], and the last two studies reported medical practitioner and health professionals [11,13], respectively. Regarding late and early complications reported, some studies did not provide either any details of early or late complications. The highest rate of late complications was 46.66% [9], whereas the highest rate of early ones was 5.8% [8]. Both early and late complications largely varied between the different studies, there were no prevalent complications mentioned in any of the studies. In one study that was performed between different age groups and different personnel [9], the most common late complication was meatal stenosis and it was more prevalent among those with neonates. Another study performed on neonates showed that the most common late complication was glanular adhesion (42.2%), whereas metal stenosis was prevalent in 21.9% as the second complication [7]. Another study performed on children with different ages reported that the most common complication was incomplete circumcision with redundant foreskin (26.7%) and did not report meatal stenosis [11]. One of the studies also reported the most common late complication was adhesion (15.1), whereas as meatal stenosis represented only 0.8%, the most prevalent early complication was edema (2.5%) [8], whereas the most common one reported in another study was postoperative bleeding [12].

Discussion

Circumcision is a surgical procedure that is performed for males in Islamic communities [14]. It has several advantages such as much lower risk of urinary tract infection, much lower chance of acquiring STD, heterosexuality, improved hygiene, and virtually complete elimination of the risk of invasive penile cancer [15]. This procedure can be performed using several techniques; the most common techniques used are Plastibell device, Mogen or Gomo clamp, and freehand circumcision. This procedure is safe to be performed; however, there are several risks associated with it. Almost 0.2%–3% of patients undergo operative procedure after circumcision [16,17]. Performing the operation in the neonatal period has been associated with a lower risk of complications compared to older age [18]. However, we found one study in this systemic review [9] which concluded that complications were more prevalent in neonates, especially meatal stenosis. There was no other study that compared the age as protective or risk factors for performing circumcision. One study in the

Table 1. *Summary of the article included in this review.*

Author and Publication year	Study design	Patients number and age	Type of anesthesia	Technique used and personnel who performed it	Early and late complications	Results and conclusion
Ketabchi et al., 2017 [9]	Retrospective and descriptive	*120 patients with late circumcision complications. *Four groups: Neonate = 27 (14 days) Infant = 23 (4 months) Child = 33 (6 years) Adolescent = 31 (14 years)	-Not mentioned	Classic method by -Physicians (8.33%) -Health technicians (10.83%) -Traditional circumcisers (80.83%)	*Late complications (46.66%): Insufficient foreskin removal, excessive foreskin removal, adhesions/skin bridges, inclusion cysts, abnormal healing, meatal stenosis, phimosis, chordee, and urethra cutaneous fistula. *The most common complication was meatal stenosis and was more prevalent in neonates. *There was a significant correlation between age and overall complications.	*The ratio of late complications of circumcision is significantly higher in neonates and infants as compared to children, as well as adolescents. *Age is a prevention factor for postoperative complications; suitable age was for child and adolescents. *Performing of the procedure should be in medical institution by suitable trained surgeons to avoid debilitating and prolonged complications.
Jimoh et al., 2016 [12]	Cross-sectional	*2,276 infants with mean age of 17 days	Topical	Classical Plastibell circumcision by Medical officer or Surgical resident	*Rate of overall complications = 1.1% *Early complications; postoperative bleeding (48%), wound infection (8%), and retained Plastibell (44%).	* Plastibell circumcision is safe and has few easily correctable complications. *Postoperative complications can be avoided by detailed attention to the placement of ligature, selection of appropriate Plastibell size, and adequate parental education.
Ekenze and Ezomike 2013 [7]	Prospective analysis	*64 with neonatal circumcision complications (median age at presentation = 23 months)	-Not mentioned	-Technique not provided. By -Nurse (84.4%) -Traditional practitioner (7.8%) -Doctor (7.8%)	-Late complications; glanular adhesion (42.2%), meatal stenosis (21.9%), urethrocutaneous fistula (17.2%), trapped penis (7.8%), implantation dermoid (6.2%), and glans amputation (4.7%).	* Neonatal circumcision was associated with a variety of complications that will require operative correction. *After treatment; the outcome was good in 92.2%, whereas 7.8% had a residual defect. * Adequate training of providers on safe procedure may minimize complications.
Netto et al., 2013 [8]	Prospective study	*119 children (5.9 years old)	-General anesthesia with dorsal penile block	-Plastic device circumcision with Plastibell by one surgeon	-Early complications; 5.8%; edema (2.5%), hematoma (1.6%), hemorrhage (0.8%), and urinary retention (0.8%) -Late complications; 26.8%; adhesion (15.1%), pain for device expulsion (4.2%), fibrotic scar (3.3%), paraphimosis (0.8%), edema of prepuce (2.5%), meatal estenosis (0.8%), late bleeding due to crust (0.8%), and Plastibell retention (0.8%).	*Plastic device circumcision is a fast procedure for older children with low complication rates.

continued

Author and Publication year	Study design	Patients number and age	Type of anesthesia	Technique used and personnel who performed it	Early and late complications	Results and conclusion
Thorup et al., 2013 [10]	Retrospective study	-315 boys (median age 5 years)	-General anesthesia	-Surgical procedure with caudal block	-Complications rate; 6.3% -Minor complications; 1.3% edema; 0.3%, complications with excessive residual skin; 0.6% -Significant complications; 5.1% -Acute complications; treatment of superficial skin infections, re-admissions for bleeding, hemostasis, and anesthesiological complications.	* A strong focus on high surgical/anesthesiological standards is needed to avoid complications.
Tempark et al., 2013 [13]	Case series	-11cases of boys who presented with dermatologic complications of circumcision which was performed during the newborn period	-Local	-Minor surgical procedure by medical practitioner	-Late complications; penile skin bridge, glandular adhesion of remnant foreskin, concealed penis, and a penile epidermal inclusion cyst.	Dermatologists may encounter in their own practice and offer potential options for management.
Al-Rawi 2011 [11]	Retrospective study	-45 boys (3 months–5 years)	-Not mentioned	-Plastibell by health professionals	-Late complications; 35.6% incomplete circumcision with redundant foreskin, 26.7% post-circumcision phimosis, 20% foreskin adherent to the glans, 6.7% completely buried penile shaft (concealed penis), 8.9% meatal stenosis, and 2.2% with scar due to degloving of the penile skin.	-Significant number of complications results from the use of various techniques without proper knowledge and skills. -these complications can be avoided by performing operations with adequate training in the technique and its postoperative care.

current systematic review that included neonates only reported that neonatal circumcision was associated with different complications that will require operative correction. The complications reported were late complications but no early complications reported; the late complications reported were glanular adhesion (42.2%), meatal stenosis (21.9%), urethrocutaneous fistula (17.2%), trapped penis (7.8%), implantation dermoid (6.2%), and glans amputation (4.7%). However, time-oriented treatment resulted in a better outcome in the majority of the neonates (92.2%) [7]. Two studies [8,12] concluded that the Plastibell device was safe and has few easily correctable complications. Another study [11] reported that complications resulted from using Plastibell without knowledge and skills, so Plastibell is safe for the procedure if it was used by skillful personnel. Only one study [10] reported that complications resulted were minor, significant and acute, and to avoid those complications, there is a need to focus on high surgical/anesthesiological standards. Late and early complications differed among different studies and this depended on the technique used, anesthesia, and personnel who performed the procedure and his knowledge and skills.

Conclusion

By reviewing different articles on complications of circumcision, we could conclude that younger age was associated with different complications. Untrained and unskilled personnel are yet another important reason that leads to complication after circumcision. Therefore, these complications could be avoided to a larger extent by performing it at a suitable age, by skilled and trained personnel. Also, the plastic device (Plastibell) showed good outcomes (fewer complications) even for older children when performed under a skilled doctor.

List of Abbreviations

MeSH Medical Subject Headings
STD Sexually transmitted diseases

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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Consent for publication

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Ethical approval

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