

# Post-Procedure Care Outweighs Device Factors in Determining Clinical Outcomes of Super Ring Circumcision in Indonesia: A Multicenter Retrospective Study

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## Abstract

**Introduction:** Device-based circumcision techniques, including the super-ring method, have gained increasing acceptance because of their procedural simplicity and potential clinical benefits. However, variability in clinical outcomes persists, and the role of postprocedural care remains underexplored.

**Methods:** This multicenter retrospective study analyzed 321 eligible medical records selected from 436 pediatric patients who underwent super-ring circumcision across 20 circumcision centers in Indonesia. The independent variables included procedural factors and postprocedural care practices. The outcomes were wound healing, time to ring detachment ( $\leq 10$  vs.  $> 10$  days), and edema. Data were analyzed using the chi-squared test and multivariate logistic regression. **Results:** Most patients achieved complete wound healing (83.2%) and 59.8% experienced ring detachment within 10 days. Ointment use was the strongest predictor of wound healing (odds ratio [OR], 10.65; 95% confidence interval [CI], 4.56 - 24.90;  $p < 0.001$ ). Soaking and ligation techniques were also significantly associated with healing outcomes. Ring detachment was significantly associated with activity level, soaking, and ligation (all  $p < 0.001$ ). Edema was associated with the ring type, soaking, and ointment use. **Conclusion:** Post-procedural care factors, particularly ointment application and soaking practices, were more strongly associated with clinical outcomes than

device-related factors in super-ring circumcision. These findings support the potential importance of standardized aftercare protocols in optimizing healing and reducing postoperative complications.

## Keywords

Circumcision, Super Ring, Wound Healing, Postoperative Care, Edema

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## 1. Introduction

Circumcision is one of the most common surgical procedures performed worldwide, with an estimated global prevalence of approximately one-third, or 37% - 39%, of men globally. Various reasons underlie the practice, including religious, cultural, and medical, and have been linked to a reduced risk of urinary tract infections and sexually transmitted infections, as well as improved genital hygiene [1]-[3]. Circumcision is more common in Muslim-majority countries. Other prevalence is in the United States, parts of Southeast Asia, Africa, and to a lesser extent, in Europe, Latin America, and Asia [4] [5].

Although it is included in the category of the most common surgical procedures, various errors in the procedure and impacts that occur during and after circumcision are still common. Early complications such as bleeding, injury to the glans, and local infection [6] [7], while post-procedure complications such as bleeding, systemic infection, skin bridges, keloids, and hypertrophic scar tissue often occur [6] [8]. The prevalence of circumcision complications in men is reported to range from 7 to 50.1%, with subsequent complications reported at 7.39% [1] [6]. In Indonesia, circumcision of males is performed in almost all regions, with Papua having the lowest prevalence [9]. Circumcision complications in patients with hemophilia also occur in Indonesia and have been successfully controlled. Furthermore, only three of 28 patients experienced post-procedural bleeding between 2008 and 2017 and one case between 2018 and 2022 [10].

The causes of complications in circumcision procedures are associated with lack of medical preparation, inadequate knowledge and skills of practitioners, inappropriate circumcision methods or techniques, non-sterile equipment and environments, errors in post-circumcision care, and other factors. This has an impact on the risk of increasing complications, including infection, urethral injury, and tissue necrosis, as well as the potential for repeated circumcisions owing to suboptimal results [7] [11]-[14].

In recent years, technological advances have led to the increased adoption of device-based circumcision techniques, including ring-based methods, such as Super Ring in Indonesia [15]. In general, the Super Ring method is a ring-shaped circumcision device weighing 0.3 - 0.5 grams that is placed between the glans penis and the prepuce, then tied with a knot technique according to the standard Super Ring circumcision procedure. This method can be categorized as a comple-

mentary method for circumcision because it offers several advantages, including shorter procedure time compared to conventional circumcision procedures, reduced risk of bleeding, and absence of stitches, making it suitable for infants, children, and even adults [16]-[18]. Despite these advantages, variability in clinical outcomes remains a significant concern.

Previous studies concluded that circumcision is generally safe and has a relatively low complication rate. However, complications such as delayed healing, infection, edema, and bleeding are influenced by factors such as age, surgical technique, and patient health [19]-[21]. Device-assisted methods, including the ring method, can reduce certain complications but can result in relatively long wound healing and device removal times, thus directly affecting the success of the procedure, patient recovery, caregiver satisfaction, and the risk of secondary complications.

Although most of the existing literature focuses on device safety, surgical techniques, and complication rates, limited attention has been paid to postprocedural care. In clinical practice, variations in post-procedure care, such as water exposure, immersion practices, and topical treatments, are common and often non-standardized. According to Vinci *et al.* [22] and Yu *et al.* [23], from a physiological perspective, wound healing is strongly influenced by local environmental conditions, particularly moisture balance, which regulates inflammation, epithelialization, and tissue regeneration. The lack of standardized post-circumcision care protocols can lead to inconsistent clinical outcomes, particularly in modern device-based techniques where procedural steps are already relatively standardized. This highlights a critical gap in the current evidence, particularly regarding the relative contribution of postprocedure care compared to device-related factors.

Therefore, this study analyzed the clinical, procedural, and post-procedural factors associated with wound healing, ring removal, and edema after super-ring circumcision in Indonesia. By identifying the most influential determinants, this study sought to provide evidence-based insights for optimizing post-circumcision care protocols and improving the quality and safety of services in circumcision practice.

## 2. Methods

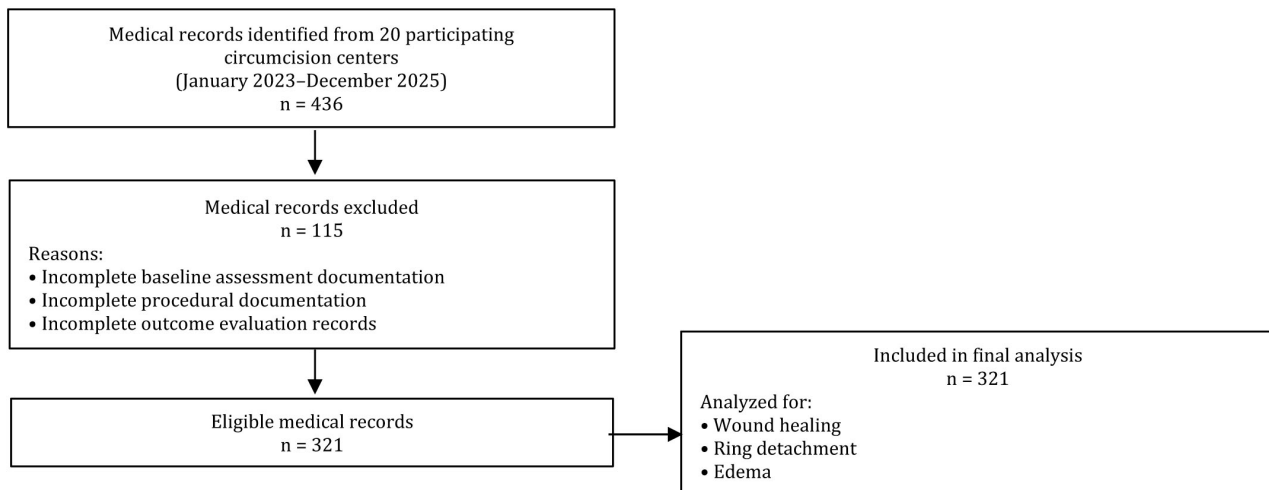
### 2.1. Study Design and Setting

This study employed a multicenter retrospective design using secondary data obtained from the medical records of pediatric patients undergoing circumcision using the super ring method. Data were collected from 20 circumcision service centers across Indonesia, including 11 centers in Java, 5 centers in Kalimantan, 2 centers in Sumatra, and 2 centers in Sulawesi. Medical records of patients who underwent circumcision between January 2023 and December 2025 were reviewed and analyzed.

### 2.2. Study Population and Sample

The study population consisted of pediatric patients who underwent super-ring

circumcision during the study period. A total of 436 medical records were initially screened. They were reviewed for completeness of initial assessment, procedure documentation, post-procedure care, and outcome evaluation. A total of 115 medical records were excluded due to incomplete documentation in one or more of these components. After applying the eligibility criteria, 321 medical records were included in the final analysis. Details of the patient screening and selection process are shown in **Figure 1**.



**Figure 1.** Flow diagram of medical record screening, eligibility assessment, and inclusion in the final analysis.

### 2.3. Variables and Measurements

Independent variables were categorized into procedural and post-procedural factors. Procedural factors included ring type, anesthesia method, and ligation technique. Post-procedural factors included water exposure, soaking practices, tellukal use, ointment application, and patient activity level. The dependent variables were clinical outcomes, including wound healing, ring detachment, and edema. All variables were extracted from standardized medical records and follow-up documentation using a structured data extraction form to ensure consistency across participating centers.

Baseline demographic and clinical characteristics available in the medical records included patient age and indication for circumcision. Most patients were older than 5 years, and only a small proportion presented with uncomplicated mild phimosis. No significant comorbidities, contraindications to circumcision, or infection-related conditions were documented in the reviewed records. Because these characteristics showed limited variability and were inconsistently recorded across participating centers, they were not included in the multivariable regression models.

Wound healing was defined as a dry and closed wound without signs of infection, characterized by the absence of wound exudate and progression to the proliferative phase of healing, indicated by a pink wound bed or complete epithelialization. Clinical outcomes were assessed during routine follow-up visits, generally scheduled on

postoperative days 3, 7, and 10, with additional monitoring every 2 - 3 days by practitioners or clinic administrators. Wound healing status was determined from the final clinical evaluation documented in the medical record, typically performed at the time of ring detachment between postoperative days 7 and 14.

Edema was defined as swelling at the circumcision site documented during follow-up evaluation and categorized by the attending practitioner as mild, moderate, or severe. For statistical analysis, edema was classified as present or absent.

Ring detachment was defined as the spontaneous separation of the super ring device from the circumcision site. Time to ring detachment was categorized into  $\leq 10$  days and  $>10$  days using the median ring detachment duration observed in the study population.

Water exposure referred to routine contact of the circumcision area with water during bathing or genital cleansing after urination and was permitted immediately after circumcision as part of the standard wound-care protocol. Soaking referred to immersion of the circumcision area in plain or warm water during the post-procedural care period and was generally recommended from the third postoperative day onward, although it could be initiated earlier according to patient and caregiver preference. The use of tellukal refers to the topical application of herbal preparations containing castor oil extract as the main natural ingredient for wound care, registered with the Indonesian Food and Drug Monitoring Agency (BPOM). The use of ointment refers to the application of a topical ointment containing binahong leaf extract, aloe vera, and moisturizing ingredients to circumcision wounds, usually starting on the third postoperative day and applied twice daily after bathing to the necrotic tissue area or ligation site.

Practitioners routinely recommended water exposure, soaking, and ointment application as part of the standard post-procedural care protocol across participating centers. Information regarding adherence to these recommendations was documented during routine follow-up assessments and extracted from the medical records.

## **2.4. Data Collection Procedure**

Data were collected retrospectively by reviewing medical records from participating circumcision centers. A standardized data extraction form and operational codebook were used to ensure consistency in data collection and variable classification. All extracted data were reviewed according to predefined operational definitions. Patient identifiers were removed before analysis, and the final dataset was anonymized to maintain confidentiality.

## **2.5. Statistical Analysis**

Data analysis was performed using statistical software. Descriptive statistics were used to summarize baseline characteristics and clinical outcomes and are presented as frequencies and percentages. Bivariate analysis was performed using the chi-square test to identify associations between independent variables and study

outcomes. Variables with a p-value <0.25 in the bivariate analysis were included in the multivariable analysis.

Multivariable analysis was performed using binary logistic regression to identify independent predictors of wound healing, ring detachment, and edema. For logistic regression analyses, binary variables were coded as 1 = exposure present and 0 = exposure absent, with the absence category serving as the reference group. Accordingly, wound healing was coded as 1 = healed and 0 = not healed, while ointment use, soaking, and water exposure were coded as 1 = yes and 0 = no. For edema analysis, the absence of edema served as the reference category. Activity level was entered as a categorical variable, with light activity used as the reference category. Ring type was analyzed as a categorical variable, with the classic ring serving as the reference category. The ligation technique was analyzed using the two routinely applied approaches, with the conventional double-ligation technique serving as the reference category.

Because the primary objective of the study was to evaluate patient-level associations, center-level adjustment and clustered standard errors were not applied. Data from all participating centers were pooled and analyzed using conventional logistic regression models. Results are presented as odds ratios (ORs) with 95% confidence intervals (CIs). Statistical significance was set at  $p < 0.05$ .

## 2.6. Ethical Considerations

This study was approved by the Health Research Ethics Committee of Stikes Intan Martapura (certificate number 023/KE/YBIP-SI/III/2026). As this study used retrospective, anonymous data, the requirement for informed consent was waived. All data were handled confidentially and were used solely for research purposes.

## 3. Results

A total of 436 medical records from 20 participating circumcision centers were screened between January 2023 and December 2025. Of these, 115 records were excluded because of incomplete baseline assessment, procedural, or outcome documentation. The final analysis included 321 eligible pediatric patients who underwent circumcision using the super ring method (**Figure 1**).

The baseline characteristics of the study participants are presented in **Table 1**. The majority of patients were from Java (50.5%) and Kalimantan (43.0%), with most patients aged >5 years (77.6%). Ring V was the most commonly used device (55.1%), and nearly all procedures were performed using needle-free injection (99.1%). Regarding post-procedural care, most patients were exposed to water (85.0%) and underwent soaking (77.6%), while 54.2% received ointment application.

**Table 1.** Characteristics of patients (n = 321).

Variables	n	%
<b>Region</b>		
Java	162	50.5

## Continued

Kalimantan	138	43.0
Sulawesi	3	0.9
Sumatra	18	5.6
<b>Age category</b>		
≤5 years	72	22.4
>5 years	249	77.6
<b>Type of super ring</b>		
Classic ring	57	17.8
Magic ring	18	5.6
Ring V	177	55.1
Reborn ring	69	21.5
<b>Anesthesia method</b>		
Injection	3	0.9
FNI (needle-free)	318	99.1
<b>FNI device type</b>		
Madajet	225	70.1
RamboJet	6	1.9
SmartJet	12	3.7
SuperJet	45	14.0
Thesera	33	10.3
<b>Ligation technique</b>		
Non-standard	198	61.7
Standard (SOP)	123	38.3
<b>Water exposure</b>		
No exposure	48	15.0
Exposure	273	85.0
<b>Soaking</b>		
No	72	22.4
Yes	249	77.6
<b>Tellukal use</b>		
No	108	33.6
Yes	213	66.4
<b>Ointment use</b>		
No	147	45.8
Yes	174	54.2
<b>Activity level</b>		
Light activity	129	40.2
Moderate activity	174	54.2
Heavy activity	18	5.6

The clinical outcomes are summarized in **Table 2**. Most patients achieved successful wound healing (83.2%) and 59.8% experienced ring detachment within 10 days. However, postoperative edema was observed in 68.2% of patients.

**Table 2.** Clinical outcomes.

Outcome	n	%
<b>Wound healing</b>		
Not healed	54	16.8
Healed	267	83.2
<b>Ring detachment time</b>		
≤10 days	192	59.8
>10 days	129	40.2
<b>Edema</b>		
No edema	102	31.8
Edema present	219	68.2

Bivariate analysis (**Table 3**) showed that several factors were significantly associated with wound healing, including ring type ( $p = 0.006$ ), ligation technique ( $p = 0.004$ ), water exposure ( $p = 0.011$ ), soaking ( $p = 0.001$ ), and ointment use ( $p < 0.001$ ). For ring detachment, significant associations were observed with the ligation technique, activity level, water exposure, soaking, and ointment use (all  $p < 0.05$ ). Edema was significantly associated with ring type ( $p < 0.001$ ), soaking ( $p = 0.024$ ), and tellukal use ( $p = 0.001$ ).

**Table 3.** Bivariate analysis.

Variables	Healing (p)	Ring detachment (p)	Edema (p)
Type of ring	0.006	0.066	0.001
Ligation	0.004	<0.001	0.447
Activity	0.976	<0.001	0.155
Water exposure	0.011	<0.001	0.802
Soaking	0.001	<0.001	0.024
Tellukal	0.371	0.736	0.001
Ointment	<0.001	0.023	0.079

Multivariate logistic regression analysis (**Table 4**) identified ointment use as the dominant factor associated with wound healing (odds ratio [OR] = 10.65; 95% CI: 4.56 - 24.90;  $p < 0.001$ ). Ligation technique (OR = 0.46;  $p = 0.021$ ) and soaking (OR = 0.20;  $p = 0.012$ ) were also significantly associated with healing outcomes, while water exposure showed a borderline association ( $p = 0.059$ ).

Activity level (OR = 0.18;  $p < 0.001$ ), soaking (OR = 0.15;  $p < 0.001$ ), and ligation

technique (OR = 4.67;  $p < 0.001$ ) were the strongest predictors of ring detachment. In addition, ointment use (OR = 0.47;  $p = 0.018$ ) and ring type (OR = 0.71;  $p = 0.010$ ) were significantly associated.

Regarding edema, multivariate analysis demonstrated that ring type (OR = 1.34;  $p = 0.023$ ), soaking (OR = 0.42;  $p = 0.009$ ), and ointment use (OR = 2.05;  $p = 0.015$ ) were significant predictors, while tellukal use was not statistically significant.

**Table 4.** Multivariate analysis.

Variables	Healing OR (95% CI)	P	Detachment OR (95% CI)	P	Edema OR (95% CI)	P
Type of ring	1.16 (0.86 - 1.56)	0.334	0.71 (0.54 - 0.92)	0.010	1.34 (1.04 - 1.73)	0.023
Ligation	0.46 (0.24 - 0.89)	0.021	4.67 (2.61 - 8.36)	<0.001	-	-
Activity	-	-	0.18 (0.10 - 0.31)	<0.001	-	-
Water exposure	0.23 (0.05 - 1.06)	0.059	-	-	-	-
Soaking	0.20 (0.05 - 0.70)	0.012	0.15 (0.07 - 0.31)	<0.001	0.42 (0.22 - 0.81)	0.009
Tellukal	-	-	-	-	1.58 (0.88 - 2.84)	0.129
Ointment	10.65 (4.56 - 24.90)	<0.001	0.47 (0.25 - 0.88)	0.018	2.05 (1.15 - 3.64)	0.015

#### 4. Discussion

This study analyzed the clinical, procedural, and postprocedural factors associated with wound healing, ring removal, and edema after super-ring circumcision. These findings suggest that postprocedural care factors were more consistently associated with clinical outcomes than device-related factors. Previous studies on pediatric and device-based circumcision have primarily focused on procedural safety, operative efficiency, and device performance [24] [25], whereas post-procedural care practices have received comparatively less attention.

This study found that ointment use was the most dominant factor associated with wound healing, with patients receiving ointment having a more than tenfold higher likelihood of achieving optimal healing. These findings are consistent with wound healing theory, which emphasizes the importance of maintaining a moist wound environment to accelerate epithelialization and tissue regeneration [26] [27]. Previous studies by Leise [28], Bounds *et al.* [29], and Teskey *et al.* [30] have reported that topical agents can support healing by reducing the risk of infection and promoting the proliferative phase of wound repair. The strong association observed in the present study suggests that topical therapy may be an important component of post-circumcision care.

However, the association between ointment use and multiple outcomes should be interpreted cautiously. Although ointment application was strongly associated with improved wound healing, the study's retrospective design precludes causal inference. Furthermore, residual confounding cannot be completely excluded despite multivariable adjustment. Therefore, the observed findings should be inter-

preted as evidence of an association rather than a direct therapeutic effect and warrant confirmation in prospective studies.

Immersion and water exposure were also significantly associated with healing outcomes. Interestingly, patients who underwent immersion performed better in multivariate analysis, suggesting that controlled wound hydration may facilitate the removal of necrotic tissue and promote faster healing. This aligns with Winter's principles of moist wound healing [31] [32], where adequate hydration increases cell activity and reduces tissue desiccation through cellular processes such as keratinocyte migration, collagen synthesis, and autolytic debridement while simultaneously reducing pain and scarring [26] [33]. However, excessive or uncontrolled water exposure may increase the risk of inflammation as reflected by the borderline association observed in this study. This suggests that not only the presence but also the method and timing of water exposure are clinically important.

Procedural factors, such as the ligation technique, are also significantly associated with wound healing and ring removal. Adequate ligation ensures optimal compression leading to controlled ischemia and effective necrosis of the foreskin. Insufficient compression can delay ring removal, whereas excessive compression can increase inflammation and edema. These findings are consistent with the theoretical principles of device-based or ligation-based circumcision, where mechanical compression directly influences the tissue response [34]-[36].

Regarding ring removal, this study identified the activity level, immersion, and ligation as the strongest predictors. Patients with controlled activity levels and appropriate immersion practices experienced faster ring removals. This suggests that mechanical stress and tissue hydration play crucial roles in separating necrotic and viable tissues [37]-[39]. These findings highlight the importance of patient education regarding post-procedural activities and care practices.

Edema, ring type, immersion, and ointment use were identified as significant factors. The association between ring type and edema suggests that device design and anatomical compatibility may influence local tissue response. Immersion reduces the likelihood of edema, possibly by improving circulation and reducing local inflammatory accumulation. Interestingly, ointment use was associated with increased edema in multivariate analysis, possibly reflecting a more complex interaction between topical agents and the inflammatory process, which requires further investigation.

A key finding of this study is that device-related factors, such as ring type, were less consistently associated with clinical outcomes than were post-procedural care variables. While device innovation has been the focus of much previous research, the current findings suggest that optimizing aftercare protocols may lead to greater improvements in patient outcomes. This highlights a critical gap in current clinical practice: the standardization of post-circumcision care remains limited.

This study has several strengths. The multicenter design involving 20 circum-

cision centers across different regions of Indonesia enhances the representativeness and generalizability of the findings. In addition, the relatively large sample size and the use of real-world clinical data provide valuable insight into routine post-circumcision care practices. The study also extends the existing literature by examining both procedural and post-procedural factors, with particular attention to aftercare practices that have received comparatively limited investigation.

Nevertheless, several limitations should be considered when interpreting the findings. First, the retrospective design may have introduced information bias due to variations in documentation practices across participating centers and does not permit causal inference. Second, several potentially relevant clinical variables, including detailed indications for circumcision, comorbidities, and infection-related conditions, were not consistently documented and therefore could not be included in the multivariable analyses. Third, although water exposure, soaking, and ointment application were routinely recommended as part of standardized post-procedural care, the duration, frequency, and adherence to these practices could not be fully verified from the medical records. Consequently, residual confounding cannot be completely excluded. Future prospective studies with standardized follow-up protocols are needed to confirm the observed associations.

This study provides new evidence that post-procedural care factors, particularly ointment use and soaking practices, were more strongly associated with clinical outcomes than device-related factors in super-ring circumcision. Unlike previous studies that primarily focused on surgical techniques and device safety [25] [40]-[44], the present findings highlight the potential importance of aftercare practices in wound healing, ring detachment, and edema outcomes. These findings contribute to the development of evidence-based aftercare protocols and support greater attention to comprehensive postoperative management alongside ongoing device innovation.

## 5. Conclusion

Post-procedural care factors, particularly ointment use and soaking practices, were more strongly associated with clinical outcomes following super-ring circumcision than device-related factors. These findings highlight the importance of standardized aftercare protocols and suggest that postoperative management is an important component of optimizing healing and reducing complications.

## Consent

The requirement for patient consent was waived owing to the retrospective nature of the study using anonymized medical records. No identifiable patient information was included in the analysis or in the publications.

## Authors' Contributions

HR and AF designed the study, analyzed the data, and wrote the initial manuscript. HR, AF, RMS, AS, and MH reviewed the manuscript and made improve-

ments. All authors were involved in data collection and selection and have read and approved the final manuscript.

## Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

## References

- [1] Fahmy, M. (2017) Complications of Male Circumcision (MC). In: Fahmy, M., Ed., *Congenital Anomalies of the Penis*, Springer International Publishing, 227-235. [https://doi.org/10.1007/978-3-319-43310-3\\_35](https://doi.org/10.1007/978-3-319-43310-3_35)
- [2] Morris, B.J., Wamai, R.G., Henebeng, E.B., Tobian, A.A., Klausner, J.D., Banerjee, J., *et al.* (2016) Estimation of Country-Specific and Global Prevalence of Male Circumcision. *Population Health Metrics*, **14**, Article No. 4. <https://doi.org/10.1186/s12963-016-0073-5>
- [3] Kling, S. (2025) The Ethics of Neonatal Male Circumcision. *Current Allergy and Clinical Immunology*, **38**, 121-217.
- [4] Elsayed, B., Elmarasi, M., Madzime, R.J., Mapahla, L., ElBadway, M.M.S. and Chivese, T. (2024) Estimates of the Prevalence of Male Circumcision in Sub-Saharan Africa from 2010-2023—A Systematic Review and Meta-Analysis. *PLOS ONE*, **19**, e0298387. <https://doi.org/10.1371/journal.pone.0298387>
- [5] Porche, D.J. (2007) Adult Male Circumcision. *The Journal for Nurse Practitioners*, **3**, 226-227. <https://doi.org/10.1016/j.nurpra.2007.02.014>
- [6] Fahmy, M.A.B. (2019) Prevalence of Male Circumcision Complications. In: Fahmy, M.A.B., Ed., *Complications in Male Circumcision*, Elsevier, 49-63. <https://doi.org/10.1016/b978-0-323-68127-8.00007-7>
- [7] Fahmy, M.A.B. (2019) Infectious Complications of Circumcision. In: Fahmy, M.A.B., Ed., *Complications in Male Circumcision*, Elsevier, 73-98. <https://doi.org/10.1016/b978-0-323-68127-8.00009-0>
- [8] Sağır, S., Azizoğlu, M. and Ergün, M. (2023) Fewer Knots in Circumcision Are Associated with Less Postoperative Pain: A Retrospective Comparative Study. *Neonatology, Surgery and Perinatal Medicine*, **8**, 25-30. <https://doi.org/10.24061/2413-4260.xiii.1.47.2023.4>
- [9] Bailey, R.C., Praptoraharjo, I., Muryani, N., Soeselo, D.A., Ghosh, S. and Levy, J.A. (2025) Introduction of Voluntary Medical Male Circumcision for HIV Prevention in Tanah Papua, Indonesia. *AIDS and Behavior*, **29**, 2420-2430. <https://doi.org/10.1007/s10461-025-04704-z>
- [10] Widjajanto, P.H., Hadi, N., Saputro, I.O., Wibowo, A., Budiono, N., Tusino, A., *et al.* (2024) Circumcision in Subject with Hemophilia: The Yogyakarta Method. *Paediatrica Indonesiana*, **64**, 244-249. <https://doi.org/10.14238/pi64.3.2024.244-9>
- [11] Fahmy, M.A.B. (2019) Post-Male Circumcision Penile Injuries. In: Fahmy, M.A.B., Ed., *Complications in Male Circumcision*, Elsevier, 145-169. <https://doi.org/10.1016/b978-0-323-68127-8.00012-0>
- [12] Hosseini, J., Haghani, S. and Narimani, N. (2019) Glandular Amputation by Strangulating Tied Suture: A Case Report of Late-Onset Complication in the Plastibell Circumcision Technique. *BMC Pediatrics*, **19**, Article No. 175. <https://doi.org/10.1186/s12887-019-1554-z>
- [13] Gamidov, S.I., Druzhinina, N.K., Shatylko, T.V., Gasanov, N.G., Safiullin, R.I. and

- Guluzade, K.S. (2023) Surgical Correction of Circumcision Complications. *Andrology and Genital Surgery*, **24**, 144-154.  
<https://doi.org/10.17650/2070-9781-2023-24-4-144-154>
- [14] Urakov, A.L., Sagidullina, I.R. and Shabanov, P.D. (2025) Targeted Temperature Management, Warm Alkaline Hydrogen Peroxide Solutions, and Dilute Solutions of Local Anesthetics as Safety Factors for Circumcision. *Reviews on Clinical Pharmacology and Drug Therapy*, **23**, 145-157. <https://doi.org/10.17816/rcf677680>
- [15] PDKI (2021) Super Ring Indonesia. Trademark Registration, Ministry of Law and Human Rights, Republic of Indonesia.
- [16] Suwarno, A. and Mazidu, R. (2020) CORPUS Circumcision Overview in Practice & Update Skill of Circumcision. PT Sunat Modern Indonesia.
- [17] Divisi Kurikulum PT SMI (2022) Standar Kurikulum Pelatihan Sunat Modern Super Ring. PT Sunat Modern Indonesia.
- [18] Suwarno, A., Rahman, L.A., Widodo, N.S.A., Heryyanoor, H., Febriana, A. and Yuliana, I. (2022) Super Ring Modern Circumcision Training with Free Needle Injection Anesthesia in Improving the Skills of Health Workers. *Community Empowerment*, **7**, 994-998. <https://doi.org/10.31603/ce.7167>
- [19] Boakye, S.A. and Obeng, F. (2025) Clinical Outcomes of Circumcisions and Prevalence of Complications of Male Circumcisions: A Five-Year Retrospective Analysis at a Teaching Hospital in Ghana. *PLOS Global Public Health*, **5**, 1-15.  
<https://doi.org/10.1371/journal.pgph.0003788>
- [20] Peng, L., Han, Y.-F., Chen, D., Lai, B. and Huang, H.-C. (2020) Comparison of the Disposable Circumcision Stapler, Disposable Prepuce Ligator and Traditional Surgical Method in Circumcision. *National Journal of Andrology*, **26**, 1101-1104.  
<https://www.scopus.com/inward/record.uri?eid=2-s2.0-85122549958&partnerID=40&md5=77d59c2bbf41604e28532ef4a6e305c2>
- [21] Feldblum, P.J., Odoyo-June, E., Bailey, R.C., Jou Lai, J., Weiner, D., Combes, S., *et al.* (2016) Factors Associated with Delayed Healing in a Study of the Prepex Device for Adult Male Circumcision in Kenya. *JAIDS Journal of Acquired Immune Deficiency Syndromes*, **72**, S24-S29. <https://doi.org/10.1097/qai.0000000000000736>
- [22] Vinci, V., Di Giuli, R., Fontoura Andrade Reis, A.P. and Klinger, M. (2024) Wound Care in Aesthetic Surgery. In: Maruccia, M., Papa, G., Ricci, E. and Giudice, G. Eds., *Pearls and Pitfalls in Skin Ulcer Management*, Springer International Publishing, 511-521. [https://doi.org/10.1007/978-3-031-45453-0\\_44](https://doi.org/10.1007/978-3-031-45453-0_44)
- [23] Yu, H., Li, Y., Huang, W., *et al.* (2024) Study on the Use of Auricular Pressure Bean Combined with Compound Tung Leaf Burn Oil in Incision Healing after Circumcision. *Journal of Men's Health*, **20**, 64-71.
- [24] Hohlfeld, A.S., Ebrahim, S., Zaki Shaik, M. and Kredon, T. (2022) Circumcision Devices versus Standard Surgical Techniques in Adolescent and Adult Male Circumcisions: A Cochrane Review. *BJU International*, **130**, 26-34.  
<https://doi.org/10.1111/bju.15604>
- [25] Ahmad, I., Tang, J., Khondker, A., Malik, A., Chua, M., Rickard, M., *et al.* (2024) Evaluating Safety of Ring versus Clamp Devices in Neonatal Circumcision: A Meta-Analysis. *Journal of Pediatric Surgery*, **59**, Article 161606.  
<https://doi.org/10.1016/j.jpedsurg.2024.06.015>
- [26] Nuutila, K. and Eriksson, E. (2021) Moist Wound Healing with Commonly Available Dressings. *Advances in Wound Care*, **10**, 685-698.  
<https://doi.org/10.1089/wound.2020.1232>

- [27] Tan, S.T. and Dosan, R. (2019) Lessons from Epithelialization: The Reason behind Moist Wound Environment. *The Open Dermatology Journal*, **13**, 34-40. <https://doi.org/10.2174/1874372201913010034>
- [28] Leise, B.S. (2018) Topical Wound Medications. *Veterinary Clinics of North America: Equine Practice*, **34**, 485-498. <https://doi.org/10.1016/j.cveq.2018.07.006>
- [29] Bounds, K., Colmer-Hamood, J.A., Myntti, M., Jeter, R.M. and Hamood, A.N. (2022) The Influence of a Biofilm-Dispersing Wound Gel on the Wound Healing Process. *International Wound Journal*, **19**, 553-572. <https://doi.org/10.1111/iwj.13653>
- [30] Teskey, S.J.L., Khoma, L., Lorbes, M. and Miller, C.C. (2026) Nitric Oxide-Releasing Gels in the Context of Antimicrobial Stewardship, Biofilm Management, and Wound-Repair Biology. *Antibiotics*, **15**, Article 54. <https://doi.org/10.3390/antibiotics15010054>
- [31] Weller, C. (2009) Interactive Dressings and Their Role in Moist Wound Management. In: Rajendran, S., Ed., *Advanced Textiles for Wound Care*, Elsevier, 97-113. <https://doi.org/10.1533/9781845696306.1.97>
- [32] Inagawa, K. and Moriguchi, T. (2012) Classification and Selection of Modern Wound Dressing Materials. *Japanese Journal of Plastic Surgery*, **55**, 237-246. <https://www.scopus.com/inward/record.uri?eid=2-s2.0-84861493823&partnerID=40&md5=3479c669ec318a77811aa30f06bc0488>
- [33] Faure-Chazelles, C. (2014) Dressings for Necrosed Skin. In: Téot, L., Meaume, S., Akita, S., Ennis, W.J. and del Marmol, V., Eds., *Skin Necrosis*, Springer, 251-256. [https://doi.org/10.1007/978-3-7091-1241-0\\_41](https://doi.org/10.1007/978-3-7091-1241-0_41)
- [34] Saeed, A., Gregory, D., Amin, R., Khanbhai, M. and Khan, A. (2023) A Novel Disposable Ring (Circumplast) Showed No Ring Migration onto the Shaft of the Penis in First 1000 Male Children's Circumcisions in a Community Specialist Clinic. *Journal of Pediatric Surgery Case Reports*, **92**, Article 102603. <https://doi.org/10.1016/j.epsc.2023.102603>
- [35] Ikhismojie, S.O., Ademuyiwa, A.O., Bode, C.O. and Mofikoya, B.O. (2017) Is the Plastibell of Any Haemostatic Value after 24 H? *African Journal of Paediatric Surgery*, **14**, 5-7. [https://doi.org/10.4103/ajps.ajps\\_19\\_16](https://doi.org/10.4103/ajps.ajps_19_16)
- [36] Nicassio, L., Ching, C.B., Klamer, B., Sebastião, Y.V., Fuchs, M., McLeod, D.J., *et al.* (2021) Gomco Vs. Plastibell Office Circumcision: No Difference in Overall Post-Procedural Complications and Healthcare Utilization. *Journal of Pediatric Urology*, **17**, 85.E1-85.E7. <https://doi.org/10.1016/j.jpuro.2020.11.019>
- [37] Ennab, R.M., Aljabali, A.A.A., Charbe, N.B., Barhoum, A., Alqudah, A. and Tambuwala, M.M. (2022) Nanocelluloses in Wound Healing Applications. In: Barhoum, A., Ed., *Handbook of Nanocelluloses*, Springer International Publishing, 649-676. [https://doi.org/10.1007/978-3-030-89621-8\\_41](https://doi.org/10.1007/978-3-030-89621-8_41)
- [38] Olutoye, O.O., Eriksson, E., Menchaca, A.D., *et al.* (2024) Management of Acute Wounds—Expert Panel Consensus Statement. *Advances in Wound Care*, **13**, 553-583. <https://doi.org/10.1089/wound.2023.0059>
- [39] Gümüs, N. (2012) Negative Pressure Dressing Combined with a Traditional Approach for the Treatment of Skull Burn. *Nigerian Journal of Clinical Practice*, **15**, 494-497. <https://doi.org/10.4103/1119-3077.104539>
- [40] Kalyenci, B., Benlioglu, C., Ölçücü, M.T., Teke, K., Sever, S., Çift, A., *et al.* (2025) Retrospective Analysis of Clinical Outcomes and Early Complications of Conventional Circumcision Techniques and Thermocautery-Assisted Circumcision. *Scientific Reports*, **15**, Article No. 7139. <https://doi.org/10.1038/s41598-025-91730-5>

- 
- [41] Palinrungi, M.A., Faruk, M., Marewa, M.R., Chairul, A.M., Arista, A.A., Thalib, N., *et al.* (2025) Comparison of Novel Dorsal Buttonhole Slit *versus* Conventional Dorsal Slit Circumcision: Efficacy, Safety, and Parents' Satisfaction. *Archivio Italiano di Urologia e Andrologia*, **97**, Article No. 13999. <https://doi.org/10.4081/aiua.2025.13999>
- [42] Essa, M. (2023) Safety, Acceptability, and Feasibility of Male Circumcision Using the Alisklamp Device. *Journal of Pediatric Urology*, **19**, 107.E1-107.E10. <https://doi.org/10.1016/j.jpuro.2022.09.013>
- [43] Modekwe, V.I., Ezeifedikwa, C., Nwosu, E.T., Nwankwo, E.U., Ekwunife, O.H., Ugwu, J.O., *et al.* (2025) A Comparison of Three Techniques in Neonatal Circumcision: Artery Forceps, Bone-Cutter, and Gomco Clamp Methods. *Ethiopian Journal of Health Sciences*, **35**, 28-34. <https://doi.org/10.4314/ejhs.v35i1.5>
- [44] Akyüz, O. and Tatar, Z. (2021) Is It Safe to Use a Thermocautery Device for Circumcision? Examination of the Histopathological Changes Emerging after Thermocautery-assisted Circumcisions. *Andrologia*, **53**, e13968. <https://doi.org/10.1111/and.13968>