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Chinese Shang Ring Male Circumcision: A Review

Keywords

Male circumcision · Shang Ring · Complication · Human immunodeficiency virus · Sexual transmitted infections

Abstract

Chinese Shang Ring adult male circumcision (SC) is a safe and effective procedure which is easy to learn and to perform. By a specially designed small device, male circumcision (MC) can be performed in 5 min. Compared with conventional adult MC (CC), SC has shorter operation time, less blood loss, less pain score, higher appearance satisfaction rate, and lower complication rate. SC was first developed in China. As recent studies have demonstrated that MC reduced the risk of acquiring human immunodeficiency virus (HIV) infection via vaginal intercourse in African countries, SC was introduced into Africa to fight HIV. Other sexually transmitted diseases such as human papillomavirus infection may also be prevented by SC. In conclusion, Chinese Shang Ring, a small device, provides an easy, quick, safe, and effective method to perform adult MC.

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Introduction

Male circumcision (MC), which has been in practice for more than 5,000 years, is one of the most common surgical procedures in the world [1]. During MC, the re-

dundant foreskin is removed and the glans is exposed. Because of the difference in cultural or religious traditions, MC is usually performed on new born babies in the USA and European countries [1, 2], while in eastern Asian countries such as China, MC is usually performed on adults [3, 4].

Though adult MC is widely performed, its benefits are still under investigation. The possible benefits of MC include easier urination, increased sexual pleasure, better cosmetic appearance, and improved penile topical hygiene [5]. Recently, 3 randomized, controlled clinical trials demonstrated that MC reduced the risk of acquiring human immunodeficiency virus (HIV) infection via vaginal intercourse in African countries including Kenya, Uganda, and South Africa [6–8]. Consequently, adult MC has been identified as an essential step to prevent HIV infection in regions with high rates of heterosexual transmission.

Conventional adult MC (CC) can be easily performed by an experienced urologist and the complications are rare. However, to those with less surgical training, it is a bit of a challenge to perform this operation, and the post-operative complication rate is high [9]. The urgent situation of HIV infection in Africa demands a new operative method that at least needs to meet 4 criteria: safe, effective, quick, and finally, easy to learn and easy to perform even by those with less surgical training [10].

Chinese Shang Ring MC (SC) seems to be such a new method. By using a specially designed device – Chinese Shang Ring (Wuhu Snnda Medical Treatment Appliance

Technology Co., Ltd., Wuhu City, China) – adult MC can be performed quickly, safely, and effectively even by those with less surgical expertise [11]. Chinese Shang Ring might be an ideal device for adult MC, just as Masson et al. [12] described, “the Shang Ring circumcision is safe and effective, does not require suturing or electrocautery, and is simple enough to enable the procedure to be performed by non-physician healthcare providers.”

The Structure of Chinese Shang Ring

The structure of Chinese Shang Ring is shown in Figure 1. It is a simple device which consists of 2 concentric plastic rings: the inner ring and the outer ring. The inner ring is lined with a soft silicone pad, which provides a smooth and non-bioreactive surface against the surgical wound. The outer ring consists of 2 halves which are hinged together at the same end. On each side of the halves there is a locking clasp which allows for locking itself with inner ring. When performing circumcision, foreskin will be everted and locked between inner ring and outer ring. Thus, a sandwich including inner ring, redundant foreskin, and outer ring will be formed.

SC Surgical Techniques

The surgical skills to perform Shang Ring device have been described in detail in the previous reports [12, 13]. Here, we just summarize the key steps briefly.

Choose Suitable Size for Those Who Will Accept SC

The company provides 13 different sizes based on the inner ring's inside diameter. After measuring the size of penile circumference by a measuring tape (provided in the Shang Ring package), the doctor should choose a suitable Shang Ring to minimize the risk of displacement and avoid discomfort to the patient.

Anesthesia

Standard anesthesia is a dorsal penile nerve block with or without a ring block at the penile root by 2% lidocaine. “No-needle anesthesia” was also applied successfully in SC [14].

Placement of Shang Ring

The method of placement of the Shang Ring on the foreskin is described in Figure 2. First, place inner ring at the level of the coronal sulcus; then, place 4 clamps

Fig. 1. The structure of Shang Ring. Shang Ring consists of 2 concentric plastic rings: the inner ring and the outer ring. The outer ring consists of 2 halves hinged together at the same end. On each side of the halves, there is a locking clasp which allows for locking itself with inner ring.

on the foreskin at the 3, 6, 9, and 12 o'clock positions. Carefully evert the redundant foreskin over the inner ring. Next, place the outer ring over the inner ring and lock the clasp. Thus, the redundant foreskin is sandwiched between inner ring and outer ring. The last step is using a scalpel blade to make 4 equidistant slits in the foreskin on the outside of the proximal surface of the ring. The purpose of this step is to prevent the formation of constricting circumferential scab and allow the skin to spread as it heals. After finishing this, clear the wound and dress it with a dry piece of gauze. Usually, Shang Ring circumcision can be finished in about 5 min.

Remove the Shang Ring

After 7–10 days, the Shang Ring can be removed. The procedure of removing the Shang Ring is easy, which can be finished in 3 min. First, unlock and remove the outer ring by a specially designed Shang Ring removal tool. Then, separate the inner ring from the wound margin and cut it using a blunt-end scissor. A recent randomized trial demonstrated that Shang Ring removal at different times (1–3 weeks) had little effect on healing [15].

Postoperative Management

Postoperative pain is managed by oral NSAIDs, while a small subset of patients may require 1–2 days of oral opioid analgesics. Because the healing period after Shang Ring circumcision usually takes 4 weeks, patients are suggested to follow-up in the clinics for 2–4 weeks.

Fig. 2. Surgical procedure of Shang Ring adult male circumcision. **a** Put an inner ring at the level of the coronal sulcus. **b** Place 4 clamps on the foreskin at the 3, 6, 9, and 12 o'clock positions. **c** Carefully evert the redundant foreskin over the inner ring. **d** The outer ring is placed over the inner ring and the clasp is

locked. Thus, the redundant foreskin is sandwiched between the inner ring and outer ring. **e** Redundant foreskin is removed by scissors. **f** Using a scalpel blade to make 4 equidistant slits in the foreskin on the outside of the proximal surface of the ring.

Postoperative Complications Related to SC

In an earlier study including 674 cases of SC performed in China, the postoperative complications were observed and the related reasons were carefully studied [16]. The total postoperative complication rate in this series was 8.16% (55 of 674). Complications were divided into 9 types (Fig. 3; Table 1). Preputial edema was the most common complication and the percentage was 4.45% (30 of 674). Other complications included wound dehiscence (0.59%, 4 of 674), partial protrusion of outer plate (0.59%, 4 of 674), partial deletion of outer plate (0.47%, 3 of 674), frenulum misalignment (0.47%, 3 of 674), penile skin scars (0.30%, 2 of 674), wound infection (0.30%, 2 of 674), unexpected ring detachment (0.30%, 2 of 674), and bleeding (0.30%, 2 of 674). Potential reasons for complications were analyzed. Complications such as partial protrusion of outer plate, partial deletion of outer plate, and frenulum misalignment were usually caused by improper operative procedures, which were usually performed by trainees at the primary stage of learning. Complications such as wound dehiscence, wound infection, unexpected ring detachment, and

bleeding were usually observed in patients who did not pay attention to postoperative care. Thus, proper operative procedure and proper postoperative hygiene are the 2 key factors to prevent postoperative complications.

Another study observed postoperative complications in 351 patients who underwent Shang Ring circumcision [17]. In this series, complications including wound infection (1.42%, 5 of 305), mild preputial edema (2.56%, 9 of 305), moderate preputial edema (1.42%, 5 of 305), and wound dehiscence (1.71%, 6 of 305) were reported. No other types of complications were observed and the overall postoperative complication rate was 7.11%. This study concluded that following the standard protocol of SC was the key factor in decreasing postoperative complications.

Long Time Follow-Up of SC

A retrospective study in China was reported to investigate the long-term results of 103 patients who had undergone SC [18]. The median follow-up duration of this series was 19.1 months (9–28 months). All patients were satisfied

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Fig. 3. Different types of complications after Shang Ring adult male circumcision. **a** Normal healing without apparent complications. **b** Preputial edema. **c** Ring detachment. **d** Bleeding. **e** Wound dehiscence. **f** Wound infection. **g** Deletion of outer plate. **h** Protrusion of outer plate. **i** Frenulum misalignment. **j** Penile skin scars.

Table 1. Postoperative complications after Shang Ring adult male circumcision

Types of complications	Time (after operation), weeks	Incidence, %	Possible reason	Treatment
Preputial edema	First	4.45	IO	No special treatment
Ring detachment	First	0.3	IPC or IO	Surgery may be needed
Bleeding	First	0.3	IPC or IO	Suture may be needed
Wound dehiscence	Second	0.59	IPC or IO	Suture may be needed
Wound infection	2–3	0.3	IPC or IO	Antibiotics
Deletion of outer plate	3–4	0.47	IO	Surgery may be needed
Protrusion of outer plate	3–4	0.59	IO	Surgery may be needed
Frenulum misalignment	3–4	0.47	IO	Surgery may be needed
Penile skin scars	3–4	0.3	IO	Surgery may be needed

IO, improper operation; IPC, improper postoperative care.

with cosmetic results and no significant long-term complications or adverse effects on sexual function were observed. A recent study in Kebyan reported 2–3 years of follow-up of SC. A total of 194 men were included in the study. Results showed that nearly all (99.5%) the men were satisfied with the appearance of their circumcised penis, and would recommend a SC to friends or family members [18]. These studies suggested that worries about the SC procedure could lead to delayed complications later should allay [19].

Comparing SC with CC

In the early studies for using Shang Ring device in adult MC, at least 2 randomized clinical trials (RCTs) comparing SC and CC have been performed in China. In the first trial, 402 patients accepted SC and 322 patients accepted CC [20]. Four indexes including operative time, blood loss, pain score, and erectile function were compared. The results suggested that operative time, blood

loss, and pain score in the Shang Ring group were significantly lower than those in the traditional group. However, as to erectile function, there was no difference between the 2 groups.

In the other trial, 833 patients were randomized into SC group and CC group [21]. Seven indexes including operative time, blood loss, pain score during operation and pain score 24 h after operation, postoperative complication rate, wound healing time, satisfaction rate of appearance, and treatment cost were compared. In SC group, operative time was 5 ± 1 min; blood loss was 0.98 ± 1.14 mL; pain score during and 24 h after operation was 0.25 ± 0.54 and 1.63 ± 0.87 , respectively; postoperative complication rate was 6.89%; wound healing time was 20 ± 5 days; satisfaction rate of appearance was 99.79%, and treatment cost was 871 ± 52 RMB. Compared with the CC, SC had shorter operation time, less blood loss, less pain score, higher appearance satisfaction rate, and lower complication rate. However, wound healing time was longer and treatment cost was higher in the SC group.

After these earlier investigations, more RCTs have been performed in both China and other countries [22–25]. A recent meta-analysis included 8 RCTs and 3,314 male patients [26]. Among them, 1,815 received SC and 1,499 received CC. Results showed that SC is associated with shorter operative time, lower intraoperative pain score, higher satisfaction with penile appearance, less intraoperative blood loss, lower adverse event rate, and lower wound bleeding rate than CC. Thus, SC seems to be a safer and more effective choice than CC for MC. Though SC is regarded as a mature procedure now, it is important to inform the patients about the advantages and disadvantages of both circumcision methods to help them make decisions [27].

Learning Curve of SC

SC is easy to learn and easy to perform. Unlike CC, which demands skills and surgical experiences, SC can be learned by healthcare providers through several days of training. The learning curve of SC was studied in an early study [28]. It was reported that after 10 cases of SC practice, indexes such as operative time, blood loss, and postoperative complication rate arrived at a stable phase, suggesting that trainees can handle this procedure after 10 cases of SC procedure. It is important to point out that the standard protocol of SC should be followed, and

proper surgical training and grading of complications are necessary in order to avoid severe postoperative complications [29].

Fight against Sexually Transmitted Infections with SC

The first randomized, controlled clinical trial which showed that MC reduced the rate of HIV infection among heterosexual men was launched in South Africa on 2002 [6]. Since then, 2 other randomized, controlled clinical trials held in Kenya and Uganda further confirmed the protective effect of MC in the prevention of HIV infection [7, 8]. Because these studies show that circumcision reduced HIV infection rates by 50–60% among heterosexual African men, some experts believe that MC is a key weapon in the fight against HIV [30].

The adult MC performed in Africa usually follows standard operative procedures recommended by WHO, including forceps-guide, dorsal-slit, and sleeve-resection methods [31]. All these traditional MC methods require operators with surgical skills. Furthermore, operators have to carefully suture and electrocauterize during operations, which cost a lot of time (average 20–40 min). On the contrary, SC can be performed with less time (<5 min) and no special surgical skills are required, suggesting that it might be an effective method for performing circumcision in larger population [32]. Actually, a study in Kenya seemed to support this idea. In this study, 40 SCs were performed by 2 physicians and a nurse who had undergone training in China. All operations were completed successfully [33]. Another study in Uganda enrolled 621 men; among them, 508 (82%) chose SC and 113 chose CC. Results of this study demonstrated that SC is highly acceptable and safe, and could improve the efficiency of MC services [34].

Human papillomavirus (HPV) infection is another kind of sexually transmitted infection. High-risk HPV genotypes cause cervical cancer, which is one of the most common cancers in women worldwide [35, 36]. Several observational studies reported that female partners of circumcised men had lower risk of cervical neoplasia [37]. MC reduced the prevalence of penile high-risk HPV infection by approximately 35% in men, which might benefit their female partners from HPV infection [38, 39]. Though the relationship between “male factor” and “female partner’s cervical neoplasia” is not well established [40], MC is recommended in couples who are worried about HPV infections [41]. As a safe, quick, and effective way to remove redundant foreskin, SC is expected to fight against HPV infection and HPV-related cancers.

Many Approaches to Optimize MC

Though MC is the most commonly performed surgery worldwide, many new ideas have been developed to facilitate this procedure. Quill™ device, a surgical suture designed with bidirectional barb, has been used in CC to offer a better cosmetic appearance [42]. Shang Ring and PrePex are the 2 most used in situ devices in MC [43, 44]. Circular disposable devices such as Circular Stapler and Unicire have also been invented to speed up incision healing and improve patients' satisfaction [44, 45]. Though these approaches have different advantages and disadvantages, they are safe and effective for optimizing MC.

Conclusions

Chinese Shang Ring provides an easy, quick, safe, and effective method to perform adult MC. As some common sexual transmitted diseases such as HIV and HPV

can be effectively prevented by adult MC, it is anticipated that SC will play an important role in human health-care.

Author's Contributions

Y.C. designed clinical studies. Q.M. and L.F. analyzed the data and wrote the manuscript. K.W. and Z.Y. performed the surgery. W.Y. and J.M. followed up patients. Q.M. and Y.C. reviewed, revised, and approved the final paper.

Disclosure Statement

The authors declare that they have no competing interests.

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References

- Dunsmuir WD, Gordon EM: The history of circumcision. *BJU Int* 1999;83(suppl 1):1–12.
- Sorokan ST, Finlay JC, Jefferies AL: New-born male circumcision. *Paediatr Child Health* 2015;20:311–320.
- Morris BJ, Wamai RG, Henebeng EB, Tobian AA, Klausner JD, Banerjee J, Hankins CA: Estimation of country-specific and global prevalence of male circumcision. *Popul Health Metr* 2016;14:4.
- Zeng M, Wang L, Chen C, Zeng F, Wang L, Chen C, Zeng F, Huang L, Xue R, Chen J, et al: Factors associated with knowledge of and willingness for adult male circumcision in Changsha, China. *PLoS One* 2016;11:e0148832.
- Peng YF, Cheng Y, Wang GY, Wang SQ, Jia C, Yang BH, Zhu R, Jian SC, Li QW, Geng DW: Clinical application of a new device for minimally invasive circumcision. *Asian J Androl* 2008;10:447–454.
- Peng YF, Cheng Y, Wang GY, Wang SQ, Jia C, Yang BH, Zhu R, Jian SC, Li QW, Geng DW: Male circumcision for HIV prevention in young men in Kisumu, Kenya: a randomised controlled trial. *Lancet* 2007;369:643–656.
- Gray RH, Kigozi G, Serwadda D, Makumbi F, Watya S, Nalugoda F, Kiwanuka N, Moulton LH, Chaudhary MA, Chen MZ, et al: Male circumcision for HIV prevention in men in Rakai, Uganda: a randomized trial. *Lancet* 2007;369:657–666.
- Auvert B, Taljaard D, Lagarde E, Sobngwi-Tambekou J, Sitta R, Puren A: Randomized, controlled intervention trial of male circumcision for reduction of HIV infection risk: the ANRS 1265 Trial. *PLoS Med* 2005;2:e298.
- Li HN, Xu J, Qu LM: [Shang Ring circumcision versus conventional surgical procedures: comparison of clinical effectiveness]. *Zhonghua Nan Ke Xue* 2010;16:325–327.
- Barone MA, Li PS, Awori QD, Lee R, Goldstein M: Clinical trials using the Shang Ring device for male circumcision in Africa: a review. *Transl Androl Urol* 2014;3:113–124.
- Lü NQ, Li PS, Sokal D, Cheng Y, Peng YF, Barone M, Huang YR, Goldstein M: [Progress in the clinical studies of male circumcision using the Shang Ring]. *Zhonghua Nan Ke Xue* 2011;17:195–202.
- Masson P, Li PS, Barone MA, Goldstein M: The ShangRing device for simplified adult circumcision. *Nat Rev Urol* 2010;7:638–642.
- Lei JH, Liu LR, Wei Q, Xue WB, Song TR, Yan SB, Yang L, Han P, Zhu YC: Circumcision with “no-flip Shang Ring” and “Dorsal Slit” methods for adult males: a single-centered, prospective, clinical study. *Asian J Androl* 2016;18:798–802.
- Peng Y, Masson P, Li PS, Chang Y, Tian L, Lee R, Kim H, Sokal DC, Goldstein M: No-needle local anesthesia for adult male circumcision. *J Urol* 2010;184:978–983.
- Barone MA, Awori QD, Li PS, Simba RO, Weaver MA, Okech JO, Aduda AO, Cherutich P, Muraguri N, Wekesa JM, et al: Randomized trial of the Shang Ring for adult male circumcision with removal at one to three weeks: delayed removal leads to detachment. *J Acquir Immune Defic Syndr* 2012;60:e82–e89.
- Cheng Y, Ma JW, Su XJ, Yan ZJ, Wu KR, Fang L, Ma Q, Jia XL, Yang BB, Su R: Analysis and prevention of postoperative complications after ShangRing adult male circumcision. *Chinese J Clin* 2012;6:e4474–e4476.
- Peng YF, Yang BH, Jia C, Jiang J: [Standardized male circumcision with Shang Ring reduces postoperative complications: a report of 351 cases]. *Zhonghua Nan Ke Xue* 2010;16:963–966.
- Cheng Y, Wu K, Yan Z, Yang S, Li F, Su X: Long-term follow-up for Shang Ring male circumcision. *Chin Med J (Engl)* 2014;127:1879–1883.
- Feldblum PJ, Okech J, Ochieng R, Hart C, Kiyuka G, Lai JJ, Veena V: Longer-term follow-up of Kenyan men circumcised using the ShangRing device. *PLoS One* 2015;10:e0137510.
- Li HN, Xu J, Qu LM: Shang Ring circumcision versus conventional surgical procedures: comparison of clinical effectiveness. *Zhonghua Nan Ke Xue* 2010;16:323–327.
- Cheng Y, Yan ZJ, Su XJ, Fang HW, Hu JS, Wu KR, Su R, Ma JW: A clinical comparative study of Chinese Shang Ring circumcision versus conventional circumcision. *Chin J Urol* 2011;32:333–335.

- 22 Yu J, Luo CB, Liu XP: Clinical comparative study of Shang ring circumcision and scissor circumcision. *Chin J Hum Sex* 2014;23:14–16.
- 23 Lv BD, Zhang SG, Zhu XW, Zhang J, Chen G, Chen MF, Shen HL, Pei ZJ, Chen ZD: Disposable circumcision suture device: clinical effect and patient satisfaction. *Asian J Androl* 2014;16:453–456.
- 24 Kanyago S, Riding DM, Mutakooa E, Lopez de la O A, Siedner MJ: Shang Ring versus forceps-guided adult male circumcision: a randomized, controlled effectiveness study in southwestern Uganda. *J Acquir Immune Defic Syndr* 2013;64:130–133.
- 25 Sokal DC, Li PS, Zulu R, Awori QD, Combes SL, Simba RO, Lee R, Hart C, Perchal P, Hawry HJ, et al: Randomized controlled trial of the Shang Ring versus conventional surgical techniques for adult male circumcision: safety and acceptability. *J Acquir Immune Defic Syndr* 2014;65:447–455.
- 26 Cao D, Liu L, Hu Y, Wang J, Yuan J, Dong Q, Wei Q: A systematic review and meta-analysis of circumcision with Shang Ring vs conventional circumcision. *Urology* 2015;85:799–804.
- 27 Cheng Y, Peng YF, Liu YD, Tian L, Lü NQ, Su XJ, Yan ZJ, Hu JS, Lee R, Kim HH, et al: [A recommendable standard protocol of adult male circumcision with the Chinese Shang Ring: outcomes of 328 cases in China]. *Zhonghua Nan Ke Xue* 2009;15:584–592.
- 28 Yan ZJ, Cheng Y, Su XJ, Fang HW, Hu JS, Wu KR, Su R, Ma JW: The learning curve of Chinese Shang Ring adult male circumcision. *J Chin Phys* 2011;13:97–98.
- 29 Lee R, Osterberg EC, Li PS, Goldstein M, Barone M, Combes SL, Sokal D, Gray R, Kigozi G, Watya S: Proper surgical training and grading of complications for Shang Ring circumcision are necessary. *J Acquir Immune Defic Syndr* 2013;64:e11.
- 30 Katz IT, Wright AA: Circumcision – a surgical strategy for HIV prevention in Africa. *N Engl J Med* 2008;359:2412–2415.
- 31 Golden MR, Wasserheit JN: Prevention of viral sexually transmitted infections – foreskin at the forefront. *N Engl J Med* 2009;360:1349–1351.
- 32 Sokal DC, Li PS, Zulu R, Awori QD, Agot K, Simba RO, Combes S, Lee RK, Hart C, Lai JJ, et al: Field study of adult male circumcision using the ShangRing in routine clinical settings in Kenya and Zambia. *J Acquir Immune Defic Syndr* 2014;67:430–437.
- 33 Barone MA, Ndede F, Li PS, Masson P, Awori Q, Okech J, Cherutich P, Muraguri N, Perchal P, Lee R, et al: The Shang Ring device for adult male circumcision: a proof of concept study in Kenya. *J Acquir Immune Defic Syndr* 2011;57:e7–e12.
- 34 Kigozi G, Musoke R, Watya S, Kighoma N, Ssebbowa P, Serwadda D, Nalugoda F, Makumbi F, Li P, Lee R, et al: The acceptability and safety of the Shang Ring for adult male circumcision in Rakai, Uganda. *J Acquir Immune Defic Syndr* 2013;63:617–621.
- 35 Schiffman M, Castle PE, Jeronimo J, Rodriguez AC, Wacholder S: Human papillomavirus and cervical cancer. *Lancet* 2007;370:890–907.
- 36 Arbyn M, Walker A, Meijer CJ: HPV-based cervical-cancer screening in China. *Lancet Oncol* 2010;11:1112–1113.
- 37 Castellsagué X, Bosch FX, Muñoz N, Meijer CJ, Shah KV, de Sanjose S, Eluf-Neto J, Ngelangel CA, Chichareon S, Smith JS, et al: Male circumcision, penile human papillomavirus infection, and cervical cancer in female partners. *N Engl J Med* 2002;346:1105–1112.
- 38 Zhu YP, Jia ZW, Dai B, Ye DW, Kong YY, Chang K, Wang Y: Relationship between circumcision and human papillomavirus infection: a systematic review and meta-analysis. *Asian J Androl* 2017;19:125–131.
- 39 Gray RH, Serwadda D, Kong X, Makumbi F, Kigozi G, Gravitt PE, Watya S, Nalugoda F, Ssempija V, Tobian AA, et al: Male circumcision decreases acquisition and increases clearance of high-risk human papillomavirus in HIV-negative men: a randomized trial in Rakai, Uganda. *J Infect Dis* 2010;201:1455–1462.
- 40 Gray RH, Wawer MJ, Serwadda D, Kigozi G: The role of male circumcision in the prevention of human papillomavirus and HIV infection. *J Infect Dis* 2009;199:1–3.
- 41 Morris BJ, Mindel A, Tobian AA, Hankins CA, Gray RH, Bailey RC, Bosch X, Wodak AD: Should male circumcision be advocated for genital cancer prevention? *Asian Pac J Cancer Prev* 2012;13:4839–4842.
- 42 Gu C, Tian F, Jia Z, Li G, Meng Z, Xing W, Ding Y, Jin Z, Kan Q, Yang J: Introducing the Quill™ device for modified sleeve circumcision with subcutaneous suture: a retrospective study of 70 cases. *Urol Int* 2015;94:255–261.
- 43 Fan Y, Cao D, Wei Q, Tang Z, Tan P, Yang L, Liu L, Liu Z, Li X, Xue W: The characteristics of circular disposable devices and in situ devices for optimizing male circumcision: a network meta-analysis. *Sci Rep* 2016;6:25514.
- 44 Odoyo-June E, Feldblum PJ, Fischer S, Bailey RC, Obiero W, Hart C, Veena V, Combes S, Cherutich P: Unexpected complications following adult medical male circumcision using the PrePex Device. *Urol Int* 2016;96:188–193.
- 45 Lv BD, Zhang SG, Zhu XW, Zhang J, Chen G, Chen MF, Shen HL, Pei ZJ, Chen ZD: Disposable circumcision suture device: clinical effect and patient satisfaction. *Asian J Androl* 2014;16:453–456.