Review Article

Circumcision and its effects in Africa

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Abstract: Male circumcision is one of the most commonly performed procedures in Africa, with a wide variation between the different regions on the practice. This is because circumcision is often done for religious and cultural or traditional reasons, which includes being part of rituals or rite of passage to adulthood. There had been few medical indications for the procedure until the human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS) pandemic, which is prevalent in many of the countries in the region. Evidence from randomized controlled trials conducted in the continent had shown that male circumcision could be instrumental to reducing the transmission of HIV/AIDS in heterosexual couples in high disease prevalent and low circumcision prevalent areas. This had led to the roll-out of large population-based adult male circumcisions as well as the development of tools to facilitate the procedure. Circumcision, however, is not without complications and the incidence appears related to the age of the patient, where the procedure was done, technique used and level of proficiency of the practitioners. This article reviews the practice of circumcision in Africa and highlights the impact of the procedure on the continent.

Keywords: Circumcision; voluntary male medical circumcision (VMMC); human immunodeficiency virus/acquired immune deficiency syndrome prevention (HIV/AIDS prevention)

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Introduction

Male circumcision is the commonest and one of the oldest surgical procedures carried out in non-medical settings (1). The procedure is performed on about a quarter to one-third of the world population of males (2,3). Male circumcision is performed at various ages—from neonatal period to adulthood (4). Religious and cultural beliefs have largely influenced neonatal circumcision with many adherents of Judaism and Islam adopting the practice (1). In societies where those beliefs impact on daily life, neonatal circumcision is popular. Africa, noted for traditional communalism, in many parts, has been influenced by the different socio-cultural and political effects brought about by the introduction of the major religious belief systems (5) and these can be attributed to changes in the dynamics of circumcision for religious reasons across the continent. Religious beliefs had been reported to influence the prevalence rate of male circumcision—while Muslims accounted for 69% of the population of 49 out of 118 countries with high prevalence of male circumcision in an ecological survey conducted among developing countries, the mean percentage population of Christians in those countries was 16% (6).

Recent controversies about neonatal circumcision in boys have centered around the variations in the practice between different societies based on underlying cultural norms. This has led to a plurality of opinions on neonatal circumcision (7,8). Review of recent evidence from the literature suggests that the medical benefits of newborn male circumcision outweigh

the risk and families that seek to circumcise their male children may have justification accessing the procedure (9). Furthermore, the safety of neonatal and early infant circumcision compared to those performed in older ages have been shown by large reviews which found an overall adverse event rate of 0.2–0.4% when performed by trained professionals in clinical settings (1,10,11). These reviews also found the incidence of complications to be 20- and 10-fold greater when the procedure is performed in children aged 1 to 9 or 10 years and older respectively (11). These findings are likely to ensure that neonatal procedures will remain popular in societies where circumcision is the norm or is encouraged.

On the other hand, there have been reports suggesting decreased sexual comfort in circumcised men (12,13). In a cross-sectional study of 1,059 uncircumcised and 310 circumcised men who filled an online Self-assessment of Genital Anatomy and Sexual Function Male (SAGASF-M) questionnaire in Belgium, circumcised men reported less sexual pleasure, less intense orgasm, greater penile shaft discomfort compared to uncircumcised men; with less sexual pleasure noted in those circumcised during adolescence compared to those done in childhood (12). Studies conducted on sexual functioning in men who were circumcised as adults have shown conflicting reports while some have noted increased difficulty with masturbation and reduced sensitivity and penile sensation after the procedure (13,14), others did not find significant evidence of adverse sexual functioning in circumcised men when compared to their uncircumcised counterparts (15-17). Krieger *et al.* (15) in addition, in a randomized controlled trial in Kisumu, Kenya reported increased penile sensitivity and improved orgasmic experience in circumcised men. Differences in techniques, instrumentation and infection control, among others may be responsible for the variations in sexual experience of circumcised men reported by the various studies (18).

There has been renewed interest in adult male medical circumcision as part of attempts to control the human immunodeficiency virus (HIV) pandemic in regions with low circumcision rates in sub-Saharan Africa (4,19,20). Randomized controlled trials have shown a significant reduction in HIV incidence among circumcised men with intention to treat efficacy and as-treated efficacy of 51% and 60% in Rakai, Uganda (21), 60% and 76% in Orange Farms and surrounding areas in South Africa (22) and 53% and 60% in Kisumu, Kenya (23) respectively. This benefit of circumcision has been attributed, partly, to the removal of the foreskin, which is rich in HIV-1 target cells (4,21,24,25) as well as the inner mucosa of the foreskin being thin, non-keratized and vulnerable to HIV infection (4,21,26). The increased incidence of genital ulcers in uncircumcised men and minute tears resulting from sexual intercourse could equally encourage viral invasion (21,26,27). The outcomes of those randomized controlled trials were so profound that voluntary male medical circumcision (VMMC) was rolled out in parts of sub-Saharan Africa with low prevalence of male circumcision and high prevalence of HIV infection (19). VMMC has also been demonstrated to reduce the incidence of other sexually transmitted infections (STIs) including human papilloma virus (HPV) and herpes simplex virus type 2 infections in sub-Saharan Africa (28).

Practice of circumcision across Africa

The timing and reason for circumcision in boys or men vary across the continent. Circumcision is prevalent in as much as 93% of the countries in Northern Africa compared to 62% of countries in sub-Saharan Africa (6). Whereas the procedure is done for religious purposes in Western and Northern parts of Africa, it is seldom performed in neonates in Eastern and Southern regions of the continent where circumcision is, often, a rite of passage into adulthood (29,30).

Neonatal circumcision, largely for religious and cultural purposes, is performed on more than 85% of boys in Nigeria, Western Africa, and majority of the procedure is done by nurses (56%) and doctors (35%) with a small proportion (9%) performed by traditional practitioners (2). Circumcision in neonates, although not popular in most of the high priority countries with high prevalence of HIV infection in Africa, may be adaptable to such regions in the future especially in view of savings to the health care budget of those countries. Circumcision in newborns has been shown to improve the cost-effectiveness of medical circumcision in the prevention of HIV infection—costing less at $15 *vs.* $59 for adult male circumcision and resulting in net cost per HIV infection averted of $3,932 for adolescent VMMC and $4,949 for adult VMMC (10).

Traditional male circumcision, which denotes the practice of circumcision based on cultural prescription is performed in 20% of adolescents and young men in Uganda, 33% of Tanzanians and as high as 80% in Kenya (31,32). Lau *et al.* (33) also reported traditional circumcision prevalence in 11-priority male circumcision countries in East Africa ranging from 4% in Swaziland to over 90% in

Lesotho. Circumcision, in parts of Tanzania, is practiced as a ceremony marking the transition of adolescent boys into fully-grown and heroic adults (32,34). The procedure is also required as a rite of passage during initiation into adulthood in the Xhosa tradition in South Africa and this step is necessary before a man can be afforded the benefits and privileges due to adult males (35). Similar practice is prevalent among the Yao ethnic group in Malawi, where the ceremony takes place between July and September each year and is performed on boys aged 8 to 13 years (36). However, a number of these traditional circumcisions result in mishaps and the traditional circumcisers often use more culturally acceptable but medically unsafe implements that are high risk factors for the occurrence of complications (30,37,38). Sometimes, instruments are shared between patients and instrument sanitation is often a challenge (32). Training of traditional circumcisers on safety, hygiene practices, instrumentation, and control of infections among others has been advocated to reduce the occurrence of adverse events (32,39).

VMMC

Since three major randomized controlled trials showed that VMMC leads to about 60% reduction in lifetime risk of acquiring HIV infection (21-23), international agencies and partner countries have initiated large scale roll outs of the procedure (40). Mathematical models have demonstrated that increasing the VMMC coverage to 80% in 13 selected priority countries in eastern and southern Africa by 2015 could help avert 3.4 to 3.5 million new cases of HIV infection with a health care saving of up to $16.5 billion (19,41). The cost saved from VMMC in priority countries in Africa is attributable to reductions in HIV/AIDS spending and treatment of STIs averted among others and models have shown that the savings are more substantial in strategies that include infant or early male circumcision compared to those limited to adolescents and adult populations (42). In another study using modeling techniques, scaling VMMC uptake to 87.9% of adult males in Tanzania over a 5-year period was projected to prevent 23,000 new cases of HIV infections in adults and the effect would increase geometrically over the following decade with a further 167,500 new cases of infections prevented in that country (43). In that study, the effect was projected to be a net saving of $4,200 for each infection averted and this highlights the substantial improvement in the health, social and economic benefits of VMMC (43).

In recent studies, VMMC has been found acceptable to 50% to 87% of men in sub-Saharan Africa as a means of HIV prevention (18,44,45). Male medical circumcision uptake is increased because of considerations such as improved hygiene, safety of the circumcision, very low occurrence of procedural related pain and proven protection against sexually transmitted diseases including HIV (18).

Implementation of the VMMC roll out plans would require millions of circumcisions to be performed in adult males over a few years. However, most countries involved have had a rather slow implementation process with backlogs still in the millions in terms of the numbers required to achieve 80% coverage of VMMC (40). The rapid scale up of VMMC in sub-Saharan Africa has been delayed because of inadequate number of physicians required to perform the procedure while following the guidelines of the World Health Organization (WHO) and the joint United Nations program on HIV/AIDS (UNAIDS) on suturing, hemostasis and the duration of the procedure (28). Task shifting has been suggested as a means of ensuring that the large volume of VMMC required in computerized models over the next few years to drastically reduce the burden of the HIV pandemic can be achieved (28,40). This would imply the training of non-physician providers such as nurses, clinical officers and other middle level practitioners (28,40). Other suggestions include reducing the complexity of VMMC and community engagement as well as involvement of policy makers to improve acceptability (40,46,47) since hindrances to acceptability of VMMC in populations with low prevalence of male circumcision have been reported (34,36). In a focused group discussion conducted among parishioners in Mwanza, Tanzania where the population has a low prevalence of traditional circumcision, the participants mentioned barriers to male circumcision that included "circumcision of children being a break from ancestral belief", "circumcision not seen as a church supported practice", "focus should be on spiritual rather than physical circumcision" and "promoting male circumcision could promote promiscuity" (34). Some men have also expressed reservations about VMMC because they perceive that it is "*the same as traditional circumcision practices*" (36). Social pressure is another factor reducing uptake of VMMC in communities with high prevalence of traditional circumcision but low prevalence of medical circumcision (48). Women have been noted to positively influence the willingness of adult males to undergo medical circumcision (49). This positive health behavior is not unconnected with the knowledge and perception of women that VMMC may help to reduce the transmission of HIV infection in the community (49).

Devices used for male circumcision in Africa

Neonatal circumcision is usually done with Plastibell device, Gomco clamp, Mogen clamp, AccuCirc and freehand circumcision (3,9,50,51). The essential steps in neonatal circumcision include estimating the amount of foreskin to be excised, visualizing the glans to ascertain its normality by retracting the prepuce often facilitated by dilating the preputial orifice with the aid of hemostats, freeing the prepuce from the glans penis, inserting and securing the device to be used for the procedure and leaving it in place till hemostatic control is guaranteed and removing the foreskin (9).

Adult male circumcision on the other hand is more technically demanding, requires longer time to complete, needs suturing or other means to maintain hemostasis and is associated with longer time to wound healing and thus is known to result in greater incidence of complications (28,50,52-54). In a bid to reduce the complications especially with the required volume of VMMC and shortage of surgical manpower, devices have been developed to reduce the intraoperative time, pain, hemorrhage and other complications noted with conventional circumcision as well as improve the cosmetic appearance of the phallus (28,40,52,53). These devices are either *in situ* devices (ISD) e.g., Shang Ring (Wu Hu SNNDA Medical Treatment Appliance Technology Co., LTD., Wu Hu, China) and PrePex (Circ Med Tech Limited) or circular disposable devices (CDD). The ISD are more popular than CDD in African countries where VMMC is highly encouraged.

The Shang Ring was introduced as a disposable device that could be used by non-physicians for the procedure of VMMC. The device has an internal ring placed around the penis at the coronal sulcus with a shallow groove on its outer surface that locks in a ratchet style closure with the outer rings allowing for removal of the foreskin on the seventh day without the need for hemostasis (28,53). The Shang Ring device can be easily inserted under dorsal penile nerve block (53). The device has been in use in Africa since 2008 and has been found in randomized controlled trials to be associated with lower intraoperative blood loss, shorter operation time, and less postoperative wound bleeding complications than in patients who had conventional circumcision (28,52,54). Furthermore, studies have confirmed the safety, efficacy and adaptability of the Shang Ring device for use in VMMC, especially in sub-Saharan African countries with a high proportion of uncircumcised male adults (28,52,54). The device has equally being found highly acceptable with a higher proportion of men choosing the ring over conventional dorsal slit (53). The reasons given by the men who chose the Shang Ring over conventional circumcision were shorter operative time (52%), safety (53%), less painful (41%) and faster wound healing by 25% (53). The Shang Ring circumcision method is easy to learn and the outcome of the procedure performed by new trainees and experienced healthcare providers using the technique has been found to be comparable (55).

PrePex is a sterile disposable device that consists of three rings—a placement ring inserted over the penis, an inner ring placed inside the prepuce and an elastic ring that is advanced from the placement ring to the inner ring and made to securely compress the prepuce as well as a verification thread (56,57). The device is inserted over a period ranging from 3 to 9 minutes in a non-surgical technique that does not require a sterile surgical field and is worn for 7 days while the individual goes about with his daily activities until the prepuce is necrotic and then removed with scissors (57,58). It was first introduced to Africa on a large scale in 2012 following clinical trials in Rwanda (57). Lebina *et al.* (58) in a prospective pilot cohort study of 398 PrePex circumcisions performed in South Africa, found circumcision to be safe using the device in most clients with adverse events reported in 11 (2.7%) individuals. The study, however, noted a few other minor adverse events in the clients, which were urinary retention and localized wound sepsis after removal of the device (58). A major concern in individuals circumcised with the PrePex is the degree of pain often reported during removal of the device (56,58).

ISD and CDD usage has been associated with a few challenges, which include dislocation of components, wound disruption, non-pleasant odor with PrePex, inconvenience often reported from use of ISD, long time to healing with Shang Ring and occasional suturing required for CDD as a result of hemorrhage (50,53,57,58).

Circumcision in Africa and prevention of STI

The prevalence of HIV infection has been reported to correlate with the rate of male circumcision. The HIV prevalence rate in sub-Saharan African countries with a high (>80%) prevalence of male circumcision was reported as 2.98%±0.002% compared to 16.48%±0.002% in countries with a low (<20%) prevalence of male circumcision, P<0.001 (6). In that study, each categorical increase in the prevalence of male circumcision was associated with a 2.3-fold (95% CI: 1.5–3.4, P=0.001) decrease in the

prevalence of HIV among adult males (6). The control of the HIV pandemic in sub-Saharan Africa has been multipronged with the WHO recently recommending a cascade of care approach (59). A mathematical model using variables from Ndhiwa in Western Kenya has shown that over 4 years the combination of VMMC with "treat-all" *vs.* VMMC with WHO 2013 guidelines will result in a reduction in HIV incidence rate of 49% to 65% and 35% to 56% respectively (59). Cuadros *et al.* (60) also showed that VMMC has had a significant influence on the dynamics of HIV prevalence in Tanzania, a country that is experiencing a decline in HIV prevalence, where the decline in HIV prevalence was faster in areas with low HIV prevalence and high VMMC rate than in places with high HIV prevalence and low VMMC rates.

While various aforementioned studies have shown the benefits of circumcision in reducing HIV risk, there has been a suggestion that increasing the level of education of the populace will achieve similar results. De Neve *et al.* (61) found that increasing the length of time spent in secondary schools in Botswana by 0.8 years led to reduction in the HIV risk by 8% per year. While the benefits in reducing the HIV risk could cut the health budget attributable to HIV/AIDS by as much as US $1,096 per infection it is quite understandable that the cost of secondary education in terms of direct and indirect costs would be increased as a result of this policy change (61,62).

Male circumcision has also been reported to be beneficial in the reduction of spread of other STIs (63,64). Davis *et al.* (63) conducted a randomized controlled trial in Rakai, Uganda with the intervention being circumcision of male partners of the women who were recruited into the study. The study reported the prevalence of high intensity bands in women with detectable high risk human papilloma virus (HR-HPV) of 42.7% *vs.* 55.1% (prevalence risk ratio =0.78; 95% CI: 0.65–0.94; P=0.02) in the intervention *vs.* controlled groups respectively (63). The study also noted that male circumcision appeared not to have any effect on persistent HPV infections but resulted in lower proportion of high HR-HPV band intensity in new cases of infections. Furthermore, in a prospective cohort study of HIV serodiscordant heterosexual couples enrolled in a safety and efficacy trial, female partners of circumcised men were found to have a 59% reduction in incident syphilis [adjusted hazard ratio (aHR) =0.41; 95% CI: 0.25–0.69] with 75% (aHR =0.25; 95% CI: 0.08–0.76) reduction in women without HIV and 48% (aHR =0.52; 95% CI: 0.27–0.97) reduction in those with HIV (64).

Circumcision and its effect on sexual behavior

The relationship between the practice of circumcision and sexual behavior of males appear to be more complex than could be explained by a cause and effect relationship. Lau *et al.* (33) in a study utilizing the Demographic and Health Survey (DHS) of 11-priority countries in East Africa reported that circumcised men were more likely to engage in risky sex behavior (aOR =1.65; 95% CI: 1.58–1.73) and had sexual debut before the age of 14 years (aOR =1.72; 95% CI: 1.47–2.00) although these differences were not seen in unadjusted regional results. In that study, respondents with higher levels of education and higher socioeconomic status were more likely to be circumcised (33). Balekang and Dintwa (65) on the other hand found that uncircumcised men were 6 times more likely than circumcised men to have sex while intoxicated with alcohol.

Complications of circumcision

Circumcision, although free of complications in the majority of patients, often results in untoward consequences such as excessive or inadequate skin removal, pain, haemorrhage, wound infections, skin bridge, meatal stenosis, meatal ulcers, loss of penile sensitivity, urethrocutaneous fistula, sexual dysfunction and penile amputation (2-4,66).

Serious adverse events have been reported in 0% to 2.1% of circumcisions performed in neonates and infants (3,4). More commonly encountered, however, are minor complications such as redundant skin or excessive skin removal. In a cross-sectional evaluation of 370 male infants attending an infant welfare clinic in Ibadan, Nigeria, of which 322 (87%) had been circumcised, complications were seen in 65 (20.2%) children (2). The complications reported in that study (2) included redundant prepuce (35, 54%), excessive loss of foreskin (16, 25%), skin bridges (11, 17%), amputation of the glans penis (2, 3.1%) and buried penis (1, 1.5%). A wide variation in reported rates of complication is seen in the literature because some studies are highly selective, different follow-up periods or practice are adopted, classification of complications vary and a number of circumcisions are done outside medical settings (2,3,66).

Complications are seen more frequently after medically indicated circumcisions than following those done for religious reasons in clinical settings (3). This difference is not unconnected with the older average age at the time of medical circumcision, which necessitates suturing and other measures to control hemostasis. The complication

rate, although significantly higher when performed by traditional practitioners compared to medically trained personnel, has not been found to be significantly different between various cadres of health personnel (2,66). Circumcisions done by traditional practitioners, on the other hand, continue to be associated with significantly higher complication rates. In a cross sectional study conducted in Bungoma district of Kenya, 156 (35.2%) complications were reported in 443 males circumcised in traditional settings compared to 99 (17.7%) complications in 559 individuals who had circumcisions done in clinical settings (OR =2.53; 95% CI: 1.89–3.38), P<0.001 (31). In that study, there were significantly higher proportions of respondents who were circumcised in traditional settings, were older and lived in rural areas (31). Conversely, in Israel, there are no significant differences between the complication rates in circumcisions performed by medical personnel or "mohelims" who are traditional circumcisionists, but trained as professionals for the procedure (1). Most of the circumcisions done by "mohelims" are done in the neonatal age group.

The American Urological Association (AUA) in drawing up its guidelines on circumcision noted the influence of the randomized controlled trials conducted in Africa, showing reduction in the prevalence of HIV infection as a result of male circumcision (67). The AUA recommends that the procedure should be presented as an option in view of its health benefits while noting that circumcision should not be offered as the only strategy for HIV risk reduction (68).

Conclusions

Male circumcision in Africa is a procedure that has been proven to be of public health significance in the reduction of the scourge of HIV infection while also leading to reduction in prevalence of some other STIs but is practiced in a variety of ways that may be associated with adverse effects of unacceptable magnitude. In order to achieve the set targets of the VMMC programs rolled out across sub-Saharan Africa, there is a need to strengthen existing services for surgical circumcision, broaden the available network of trained healthcare providers to perform the procedure and train them on the use of devices that have been found to be safe and associated with minimal adverse effects.

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Footnote

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