Male circumcision: cutting into the HIV epidemic in Africa

TIM HARGREAVE

Male circumcision was approved by the World Health Organization (WHO) in 2007 to help reduce the spread of HIV in Africa.

There are marked regional variations in the prevalence of HIV in Africa. At first these were thought to be because of the origin of the disease in West Africa, which was then spread across Africa by truck drivers. As the epidemic developed it became clear that there was a coincidence between high prevalence of male circumcision and lower prevalence of HIV.1 Although some experts argued for immediate adoption of male circumcision as an HIV preventive measure, others thought the difference was more likely to be a result of less promiscuous male sexual behaviour or other factors in the circumcising, predominantly Islamic, African countries.

To resolve the matter, three large prospective studies were undertaken in African countries with a high prevalence of HIV (Table 1).2–4 Remarkably and possibly uniquely in the history of clinical trials, all three had to be stopped early, at interim analysis, as it was judged unethical to continue because the beneficial effect of male circumcision was so clear.

**BENEFITS OF MALE CIRCUMCISION**

The main benefit of male circumcision is that it reduces the chance of acquisition of the HIV virus. The biological mechanism for this protective effect adds to the credibility of the epidemiological evidence.

**Biological mechanism for the protective effect of male circumcision**

Briefly, the HIV virus gains entry by attaching to receptors on Langerhans cells. Most HIV is killed within Langerhans cells, but with each exposure there is a small chance that the virus will overwhelm the killing mechanisms within the Langerhans cells. As part of the normal second-line defence, the Langerhans cells will then present virus antigen to circulating immune cells.5 This is more likely to occur if there is exposure to high viral load.6 Thus it is the antigen-presenting property of Langerhans cells that can enable HIV to gain entry.

Langerhans cells are found in the deeper layers of skin all over the body, but are particularly dense, and near to the surface, on the mucosal aspects of the foreskin. Male circumcision removes many of these Langerhans cells. Those that are left are not so susceptible to taking up HIV, probably because the surface of the skin becomes dryer7 and because the keratin layer may thicken a little.

**Other beneficial effects**

The risk of HIV infection may be reduced after male circumcision because there is less risk of minor trauma such as a torn frenulum8 and less risk of acquiring other sexually transmitted infections that can cause ulcers (Table 2).

**RISKS OF MALE CIRCUMCISION**

The risks of the operation of male circumcision include damage from the surgery with a poor cosmetic result or actual damage to the penis.17 However, in the context of proper training (Figure 1) and continuing assessment of competence, experience from the Africa programme shows that risks are low.

**Does male circumcision encourage male sexual irresponsibility?**

The worry is that public health male circumcision programmes could encourage sexual promiscuity (disinhibition) and
actually make HIV prevalence worse. To counteract this potentially harmful effect, most healthcare providers have followed the WHO advice, which is to deliver male circumcision in the context of a male sexual health package, which includes education about HIV and sexual responsibility, condom provision, and information about the availability of HIV testing and counselling. So far, the evidence is that men do not significantly change their sexual behaviour after circumcision.18–20

**Does male circumcision decrease male or female sexual pleasure?**

There have also been concerns that both male and female sexual enjoyment are compromised by male circumcision. This is a difficult area to study because, in common with all studies of sensation, it is difficult to make objective measurements. Most recent studies do not indicate any adverse effect on male sexual satisfaction. A consistent finding is a prolongation of ejaculatory latency time; this may be an advantage for younger men in whom quick ejaculation is very frequent.21 The effect of prolonged ejaculatory latency time has not been investigated in relation to circumcision status in older men.

**Table 1. Clinical trials demonstrating the protective effect of male circumcision**

<table>
<thead>
<tr>
<th>Population</th>
<th>Orange Farm (South Africa)</th>
<th>Rakai (Uganda)</th>
<th>Kisumu (Kenya)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male circumcision rate</td>
<td>20%</td>
<td>16%</td>
<td>10%</td>
</tr>
<tr>
<td>HIV incidence</td>
<td>1.6%</td>
<td>1.3%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Age range</td>
<td>18–24 years</td>
<td>15–49 years</td>
<td>18–24 years</td>
</tr>
<tr>
<td>Number of men</td>
<td>3128</td>
<td>5000</td>
<td>2784</td>
</tr>
<tr>
<td>Number of infections in circumcised group/number of infections in uncircumcised group</td>
<td>20/49</td>
<td>22/43</td>
<td>22/47</td>
</tr>
<tr>
<td>Protective effect of male circumcision</td>
<td>60% (95% CI 34–77%)</td>
<td>48%</td>
<td>53%</td>
</tr>
</tbody>
</table>

The WHO manual of technique23 is one of the tools commissioned by the WHO Reproductive Health and Research (RHR) Human Reproduction Programme (HRP) in conjunction with the Joint United Nations Programme on HIV/AIDS (UNAIDS) and Jhpiego.

**UNANSWERED QUESTIONS**

There remain many concerns and unanswered questions. So far, evidence suggests no major change in men’s sexual behaviour following adult circumcision, but there is a need for more data and long-term follow-up. There is also a need for information about whether male circumcision affects women’s ability to negotiate condom use. There are anecdotal reports that circumcised men find condoms easier to use, and there is a need for further information about this and whether condom use is influenced by the education component that is built into current African male circumcision programmes.

Questions remain about wound healing after circumcision in relation to the risk of HIV acquisition, and how long men should be advised to abstain from sexual activity or use condoms to protect the wound.

There is a continuing need to improve safety and efficacy of the circumcision procedure. This may involve not only improved procedures and practices such as task sharing and the safe use of diathermy, but also innovations such as tissue glues,24,25 haemostatic gauze, antibiotic prophylaxis and ultrasonic scalpels.26

Finally, there is great potential for male circumcision devices suitable for use in adults, as these could potentially enable a centre to perform hundreds rather than tens of procedures safely during a day. However, enthusiasm has to be tempered with objectivity and safety must remain paramount.
ETHICAL CONSIDERATIONS AND INFANT CIRCUMCISION

There remains a major ethical concern because infants cannot give consent and some argue that the risks of male circumcision in infants exceed the benefits. Parents have always given consent for public health measures that will benefit their children, such as the many different childhood vaccinations. This consent is given in spite of the risks involved because of overwhelming benefit.

Infant circumcision has been the normal cultural practice for many hundreds of years in Islamic and Jewish cultures, and there is some evidence of other benefit in terms of reduced risk of other sexually transmitted infections. Analysis of the risk–benefit ratio for infant circumcision in those countries with a high prevalence of HIV is in favour of the procedure.

Some authorities argue that male circumcision should be more widely advocated as a public health measure in all countries, but this is controversial. In countries with a low prevalence of HIV, the individual benefit is small, but the benefit to the future population may be great, as seems to be the situation in the Islamic circumcising African countries. However, consideration also has to be given to the prospects for development of other effective HIV prevention in the next 20 years, for example gels and vaccines. At present, precoital microbicides or prophylactic antiretroviral agents seem unlikely to become truly effective population preventive measures and therefore it seems risky not to embark on infant programmes in African countries with a high prevalence of HIV.

PUBLIC HEALTH MEASURES

HIV and the costs and risks (albeit very small risks), when measured against the benefit, do not stack up. Second, to achieve immediate impact, male circumcision has to be targeted at 18- to 22-year-olds, and this would be difficult to implement in the UK.

Should we be advising male circumcision for men who are at particular risk?

The question has often been asked whether male circumcision would be helpful for any special subgroups of men who are at particular risk, such as men who have sex with men (MSM). So far, the evidence indicates that there is little or no benefit in terms of reduced HIV acquisition between circumcised and uncircumcised MSM. Why is this? First, it is a difficult area to study, as the risk may be related to who does what to whom and in the published studies this is often not well defined. It is likely that the exposure to viral loads is relatively much higher because of greater promiscuity, because of the environment with the anal canal and because the risk of minor penile trauma may be greater.

What should we say to parents who request circumcision for their baby son?

Until recently, infant male circumcision has not been encouraged in the UK, as it has been seen as a religious rather than a health matter, with no significant health benefits. However, the documented risk reductions for a variety of sexually transmitted infections and the secondary benefits for women necessitate a rethink. In the UK we should not promote infant circumcision but leave it to parental choice. When male circumcision is requested by parents, there is a need for a safe and competent infant circumcision service.

Declaration of interests

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# Table 2: Effect of male circumcision on the risk of acquisition of various infections, inflammations and cancer in men and women

<table>
<thead>
<tr>
<th>Pathology</th>
<th>Men</th>
<th>Women</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human papillomavirus</td>
<td>Reduced</td>
<td>Reduced</td>
<td>Daling et al.⁹</td>
</tr>
<tr>
<td>Penile warts</td>
<td>Reduced</td>
<td>Reduced</td>
<td>Tobian et al.¹⁰</td>
</tr>
<tr>
<td>Penile cancer</td>
<td>Reduced</td>
<td>Reduced</td>
<td>Daling et al.⁹</td>
</tr>
<tr>
<td>Cervical cancer</td>
<td>Reduced</td>
<td>Reduced</td>
<td>Auvert et al.²,¹¹</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bosch et al.¹²</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Castellsague et al.¹³</td>
</tr>
<tr>
<td>Herpes simplex virus-2</td>
<td>Reduced</td>
<td></td>
<td>Tobian et al.¹⁰</td>
</tr>
<tr>
<td>Syphilis</td>
<td>Reduced</td>
<td></td>
<td>Tobian et al.¹⁰</td>
</tr>
<tr>
<td>Neisseria gonorrhoeae</td>
<td>No change</td>
<td></td>
<td>Mehta et al.¹⁴</td>
</tr>
<tr>
<td>Chlamydia trachomatis</td>
<td>No change</td>
<td></td>
<td>Mehta et al.¹⁴</td>
</tr>
<tr>
<td>Trichomonas vaginalis</td>
<td>No change</td>
<td></td>
<td>Mehta et al.¹⁴</td>
</tr>
<tr>
<td>Bacterial vaginosis</td>
<td>Reduced</td>
<td></td>
<td>Fethers et al.¹⁵</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Gray et al.¹⁶</td>
</tr>
</tbody>
</table>

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the UNDP, UNFPA, World Bank, WHO Programme of Research, Development and Research Training in Human Reproduction. He receives reimbursement from WHO for travel expenses. The opinions expressed in this article are those of the author and not necessarily those of WHO.

REFERENCES