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Original Review

Counseling Parents Who Are Considering Newborn Male Circumcision

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The American Academy of Pediatrics recently issued a statement that the health benefits of newborn male circumcision exceed the risks and therefore justify access to the procedure for families who choose it. Further, clinicians are charged with providing factually correct information that communicates the risks and benefits of elective newborn male circumcision in a nonbiased manner. However, many clinicians lack adequate information to discuss the risks and benefits of male circumcision. The purpose of this review is to highlight evidence on the risks and benefits of newborn male circumcision and provide clinicians with counseling points that can be used to guide discussion with parents considering newborn male circumcision.

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INTRODUCTION

In 1999, the American Academy of Pediatrics (AAP) issued a policy statement stating that "existing scientific evidence demonstrates potential medical benefits of newborn male circumcision; however, these data are not sufficient to recommend routine neonatal circumcision."[1] Subsequent evidence on the potential benefits of male circumcision, in particular, the results of 3 large randomized controlled trials in Africa,[2–4] prompted the AAP to reexamine this policy. In 2012, an AAP task force concluded that "evaluation of current evidence indicates that the health benefits of newborn male circumcision outweigh the risks and that the procedure's benefits justify access to this procedure for families who choose it." Of the 10 AAP task force recommendations (Table 1), 2 relate to the clinician's role in the provision of "factually correct, nonbiased information" in which the risks and benefits of elective male circumcision are delivered in a "nonbiased manner."[5]

One of every 3 males in the world is circumcised.[6] In the United States, neonatal male circumcision is one of the most common surgeries performed. From 1988 to 2000, data from the Nationwide Inpatient Sample demonstrated a significant upward trend in newborn male circumcision done during hospitalization, from 48.3% in 1988 to 1991 to 61.1% in 1997 to 2000 ($P < .0001$). Patients more likely to elect circumcision had private insurance ($P < .0001$), higher socioeconomic status ($P < .0001$), fewer comorbid diagnoses ($P < .0001$), and were white or black ($P < .0001$).[7] However, more recent data showed that from a peak of 63.5% of newborns in 1999, there has been a decline in the procedure to 56.3% in 2008.[8] Although parental acceptance of male circumcision in the United States has been reported to be as high as 88% in some studies,[9] the apparent decline may be a byproduct of changing demographics and proportionally larger numbers of newborns born to Hispanics,[10] who have rates of circumcision as low as 15.5%,[7] and more procedures being done in outpatient settings, which are not measured by Nationwide Inpatient Sample data.

Many clinicians lack adequate information to discuss the risks and benefits of male circumcision. A recent survey of 1500 physicians reported that nearly 22% were unprepared to discuss risks and benefits of newborn male circumcision with parents.[11] When parents were surveyed in the prenatal and postpartum periods on their viewpoints toward male circumcision after reading the 1999 AAP statement, 27% were either "unsure or neutral" or "will probably have a circumcision for my child," indicating that that there is substantial opportunity for clinician counseling.[12] The purpose of this review is to highlight evidence on the risks and benefits of newborn male circumcision and to provide clinicians with counseling points that can be used to guide discussion on newborn male circumcision.

METHODS

A search of the literature to find the highest level of evidence was conducted using the PubMed database with the MeSH search parameters of "circumcision, male" AND "risk OR benefit" OR "adverse effect" OR "complications" OR "prevention & control" AND "neonatal" OR "infant" OR "infant, newborn" OR "infant" AND "newborn" OR "newborn infant" OR "newborn." This yielded 88 English-language articles from 2008 to 2013. Articles published before 2008 were included if they were classic articles or the highest level of evidence on the subtopic.

BACKGROUND

Male circumcision involves the cutting of the foreskin, or prepuce, from the glans penis. To understand the controversy associated with circumcision, it is important to identify different viewpoints related to the function of the foreskin. In normal infancy, the mucosa of the glans penis is fused to the inner lining of the prepuce and can only be retracted in 4% of newborns. As the penis grows in the first 3 to 4 years of life, the

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Quick Points

- Male circumcision is undertaken for 3 reasons: religious or cultural practice, medical indication, or as a prophylactic measure against infections or disease.
- There is controversy surrounding newborn male circumcision, specifically related to whether there are genuine health benefits of improved hygiene and decreased risk of urinary tract infections, sexually transmitted infections (most prominently HIV), and penile cancer.
- In newborns at risk for recurrent urinary tract infection because of genetic or anatomic factors, circumcision is beneficial as it can reduce the risk of renal scarring and loss of renal reserve.
- Complications of newborn male circumcision occur in about 1.5% of procedures. Most of these complications are minor such as bleeding. Complications increase when circumcision is done beyond infancy.
- Counseling parents in a resource-rich health environment like the United States must include unbiased information on the health benefits and risks of newborn circumcision while reinforcing the need for condom use, vaccination, and avoidance of risky sexual behavior.

foreskin gradually separates from the glans when smegma accumulates under the foreskin.[13] By age 10 most boys have a retractable foreskin,[14] and by age 17, natural separation of the prepuce from the glans penis is usually complete.[15] The uncircumcised penis is protected with keratinized squamous epithelium that covers both penile shaft and the foreskin. Sebaceous glands near the frenulum produce a natural emollient that protects and lubricates the glans, whereas the inner foreskin contains apocrine glands that secrete substances such as lysozymes and cytokines with antibacterial properties.[14] One view is that neonatal circumcision both removes tissue containing many fine-touch receptors and interferes with the natural separation process. This may lead to subsequent sensory imbalance and risk of injury and tears that make the circumcised penis less hygienic.[16] The alternate view is that during intercourse, as the foreskin slides backward, the exposure of its inner mucosal surface with its high density of target cells for HIV, Langerhans cells, CD4+ cells, and macrophages is an entry point for pathogens. Lymphoid areas of mucosal surfaces are primary sites for HIV infection. Foreskin tissue, in particular, has been identified as both having abundant HIV target cells and susceptibility to trauma because of its thinly keratinized surface.[17] In theory, removal of the foreskin via circumcision reduces target cells and exposes the more keratinized penile shaft, thereby diminishing the entry points for pathogens.

Male circumcision is undertaken for 3 reasons: religious or cultural practice, medical indication, or as a prophylactic measure against infections or disease. For thousands of years, circumcision has been done for religious and cultural reasons. *Brit milah*, the ritual circumcision of male infants in Judaism, is an obligatory commandment performed on the eighth day of life. In Islam, male circumcision is known as *tahara,* meaning purification, and may be done in the neonatal period or as a rite of puberty. Although most of the circumcised males in the world are Muslim,[6] circumcision is also practiced in other religions and cultures and may be part of young males' rite of passage.[14] In contrast, circumcision is rare in countries like Denmark[18] and Sweden,[19] or in the case of Germany, unlawful in males less than 14 years of age.[20] In newborns, circumcision is medically indicated when there is pathologic phimosis[13,14] (tightening of the foreskin) associated with voiding problems and relatively indicated if there is refractory balanoposthitis.[13] The controversy surrounding circumcision is whether there are health benefits: improved hygiene, prevention of balanitis, and reduced risk of urinary tract infections,[21–23] sexually transmitted infections (most prominently HIV),[2–4] and penile cancer.[24,25] Clinicians have a critical role in providing parents with evidence-based information related to health benefits and risks of newborn circumcision.

COMPLICATIONS OF MALE CIRCUMCISION

Male circumcision is a surgical procedure; therefore, counseling must include information on its potential complications (Table 2). The occurrence and severity of complications depend on the clinician's skill and level of training, cleanliness of conditions, and choice of circumcision method used. Complications increase when done beyond infancy and when anatomical variants exist.[26–28] In the United States, the most common techniques for newborn male circumcision are the Gomco clamp (Allied Healthcare Products, St. Louis, MO), the Mogen clamp, and the Plastibell (Briggs Manufactured Products LLC, Des Moines, IA). When circumcision is performed in the operating room for older boys, "freehand circumcision" using either the sleeve technique or the dorsal-ventral slit technique is most commonly used.[27] Irrespective of method, bleeding is the most common complication, with an incidence of about 1%.[29] Most postprocedure bleeding is easily managed with application of direct pressure or careful application of silver nitrate.[27] Care of the circumcised penis is presented in Table 3.[30–32]

Accuracy in reporting complications associated with circumcision has been confounded by variations in the definition of complication used and in the period of follow-up. Previous hospital-based studies of complications were usually retrospective and record based and therefore did not capture events that occurred after hospital discharge unless the infant or child was readmitted. However, a review of complications of circumcision identified 52 studies from 21 countries that reported frequency of complications from neonatal, infant, and child circumcision. The strength of this review was that results were stratified by type of study (retrospective or

Table 1. Summary of American Academy of Pediatrics Task Force Recommendations on Male Circumcision

Evaluation of current evidence indicates that the health benefits of newborn male circumcision outweigh the risks, and the benefits of newborn male circumcision justify access to this procedure for those families who choose it.
Parents are entitled to factually correct, nonbiased information about circumcision that should be provided before conception and early in pregnancy, when parents are most likely to be weighing the option of circumcision of a male child.
Physicians counseling families about elective male circumcision should assist parents by explaining, in a nonbiased manner, the potential benefits and risks and by ensuring that they understand the elective nature of the procedure.
Parents should weigh the health benefits and risks in light of their own religious, cultural, and personal preferences, as the medical benefits alone may not outweigh these other considerations for individual families. Parents of newborn boys should be instructed in the care of the penis, regardless of whether the newborn has been circumcised or not.
Elective circumcision should be performed only if the infant's condition is stable and healthy.
Male circumcision should be performed by trained and competent practitioners, by using sterile techniques and effective pain management.
Analgesia is safe and effective in reducing the procedural pain associated with newborn circumcision; thus, adequate analgesia should be provided whenever newborn circumcision is performed.
Nonpharmacologic techniques (eg, positioning, sucrose pacifiers) alone are insufficient to prevent procedural and postprocedural pain and are not recommended as the sole method of analgesia. They should be used only as analgesic adjuncts to improve infant comfort during circumcision.
If used, topical creams may cause a higher incidence of skin irritation in low-birth-weight infants, compared with infants of normal weight; penile nerve block techniques should therefore be chosen for this group of newborns.
Key professional organizations (AAP, the American Academy of Family Physicians, the American College of Obstetricians and Gynecologists, the American Society of Anesthesiologists, the American College of Nurse-Midwives, and other midlevel clinicians such as nurse practitioners) should work collaboratively to:
Develop standards of trainee proficiency in the performance of anesthetic and procedure techniques, including suturing;
Teach the procedure and analgesic techniques during postgraduate training programs;
Develop educational materials for clinicians to enhance their own competency in discussing the benefits and risks of circumcision with parents; and
Offer educational materials to assist parents of male infants with the care of both circumcised and uncircumcised penises.
The preventive and public health benefits associated with newborn male circumcision warrant third-party reimbursement of the procedure.

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prospective), age (neonatal, infant, or child), and whether performed by a medical provider or nonmedical provider.[26]

For neonatal and infant circumcision, the median frequency of any complication (Table 2) was 1.5% (range, 0%-16%). The extreme of the range, 16%, was from a series from Pakistan (N = 200), in which freehand methods, which do not shield the glans, were used.[33] The median frequency of any serious complication, defined as those with long-term sequelae such as partial amputation of the glans, urethral laceration, or need for plastic surgery, was 0% (range, 0%-2.1%). The upper limit of this range (2% or 2.1%) was found in observed studies that included infants up to a year old and when nonmedical providers were performing some of the circumcisions.[26]

When circumcision was done by trained medical providers in children aged one year or older, the frequency of any complication was higher (6%; range, 2%-14%), although there were no serious complications. When performed by medical providers, complications were more often reported when circumcision was done for medical reasons such as phimosis or balanitis rather than if done for religious reasons.[26] Although 3 of 5 studies of circumcision in children by nonmedical providers reported similar frequencies of complications (from 2.7% to 3.4%),[34–36] one reported a complication rate of 63%,[37] most of these being self-reported penile swelling, and another study reported a rate of 85%[38] for bleeding requiring suturing and wound infections attributed to nonsterile conditions.

In a recent US report, 11 newborn males who had recently undergone out-of-hospital Jewish ritual circumcision were confirmed to have herpes simplex virus (HSV) infection. Ten of the newborns were hospitalized and 2 died. In these cases, there was evidence of the ultra-Orthodox Jewish practice known as *metzitzah b'peh,* in which the mohel places his mouth directly on the newly circumcised penis and sucks blood away from the wound. Cultures were done both on hospital personnel who had cared for the infants and on the mohelim, and in the mohelim, the cultures were positive for HSV-1.[39]

In summary, complications of male circumcision are very low (1.5%) when performed by an experienced provider and when done neonatally or early in infancy. There are more complications when circumcision is done in children older

Table 2. Complications of Newborn Male Circumcision

Early complications[a]
Postcircumcision bleeding[b]
Inadequate skin removal[b]
Surgical site infection[b]
Chordee[c]
Iatrogenic hypospadias
Glandular necrosis
Glandular amputation[d]
Late complications[e]
Epidermal inclusion cysts
Suture sinus tracts
Inadequate skin removal resulting in redundant foreskin
Penile adhesions
Pathologic phimosis[f]
Buried penis
Urethrocutaneous fistulae
Meatal stenosis
Meatitis

[a]Intraoperative and within first month.
[b]Minor, easily treatable.
[c]Abnormal downward curvature of the penis.
[d]Requires prompt surgical attention.
[e]Complications related to the original circumcision that are commonly treated in an outpatient setting 1 to 2 months or more after the procedure.
[f]Inability to retract the foreskin after it was previously retractable, secondary to distal scarring of the foreskin.
Source: Krill et al.[27]

than one year (6%), and there may be more complications when done by nonmedical providers. Specifically, parents who practice Jewish male circumcision must be cautioned against the use of mohelim who incorporate *metzitzah b'peh* into the ritual.

POTENTIAL BENEFITS OF MALE CIRCUMCISION

Urinary Tract Infection

There are differing views on the relationship of neonatal circumcision to urinary tract infection (UTI). Earlier studies have consistently reported that circumcision is associated with fewer UTIs in male infants.[21,22] Wiswell reported the prevalence of UTI in circumcised boys in the first 18 months as 0.21% (4 of 1919) compared with 4.12% (24 of 583) in uncircumcised boys.[21] To et al[22] similarly reported that of boys in Canada (N = 58,434), uncircumcised newborns were 4.5 times more likely (relative risk [RR], 4.5; 95% confidence interval [CI], 2.4-8.4) to have a UTI at one month of age and at one year of age, 3.7 times as likely (RR, 3.7; 95% CI, 2.8-4.9) than uncircumcised boys. Of note is that the risk decreased further by 3 years of age (RR, 3.0; 95% CI, 2.4-3.8). The number of hospital admissions for UTIs in the first year was 1.88/1000 in the male circumcision group compared with 7.02/1000 in the uncircumcised group, indicating that 195 circumcisions would be needed to prevent one hospitalization for UTI.

Although UTI is one of the more common bacterial infections in children, it is relatively uncommon in boys. In a population study (N = 2856) conducted over 12.8 years in which most males (80.7%) were uncircumcised, the prevalence of UTI was 5.3% in girls and 2.1% in boys. Thus, female sex conferred more than twice the likelihood (adjusted odds ratio [aOR], 2.4; 95% CI, 1.5-3.8), but lack of circumcision in males was not reported as a significant risk factor.[40] An epidemiologic study of 596 cases of childhood UTI in Sweden, where circumcision is uncommon, reported the prevalence of UTI by 11 years of age to be 3.0% for girls and 1.1% for boys.[19] Other sex differences observed by Winberg et al[19] and To et al[22] were that the prevalence of UTI was highest during the first month of life and then decreased more rapidly in boys than in girls.[19] As the uncircumcised prepuce may support the growth of uropathogenic bacteria at the meatus,[41] these decreases in UTI prevalence in boys likely occurred because of the physiologic retraction of the prepuce over time.[14]

Data from studies of circumcision and UTI are limited by most studies having been observational and often having had samples with disproportionately larger groups of circumcised boys. A recent Cochrane review of circumcision for the prevention of UTI included no randomized or quasi-randomized controlled trials that met inclusion criteria.[42] A recent meta-analysis of 22 studies (21 observational and one randomized controlled trial of 70 participants)[23] examined lack of circumcision as a risk factor for UTI and reported a lifetime relative risk of UTI as 3.7 times higher than that in uncircumcised males. When age-stratified, for those aged 0 to 1 year, the relative risk was 9.91 (95% CI, 7.49-13.1); for those aged 1 to 16 years, it was 6.56 (95% CI, 3.26-13.2); and for those older than 16 years, the relative risk was 3.41 (95% CI, 0.916-12.7) in uncircumcised males. Limitations of the review were the inclusion of studies that used clean catch or bag specimens for UTI diagnosis in contrast to the AAP recommendation of suprapubic catheter aspiration or urethral catheterization,[43] as well as the preponderance of observational studies in the analysis.

Male circumcision may be warranted in boys who are at risk for recurrent UTIs. One systematic review included 12 studies with one randomized controlled trial, 4 cohort studies, and 7 case-control studies (N = 402,908) to examine whether circumcision reduced UTI in boys. Circumcision was associated with a significantly reduced risk of UTI (OR, 0.13; 95% CI, 0.08-0.20; $P < .001$) in all 3 types of study design.[44] However, given a risk of UTI in normal boys of about 1%,[19,21] the number needed to treat to prevent one UTI was 111. However, in boys with vesicoureteral reflux, an abnormal retrograde flow of urine from the bladder to the upper urinary tract, the risk of UTI recurrence increases to 10% and 30%.[45] In this high-risk group of boys, the number needed to treat was reduced to 11 and 4, respectively. As recurrence of UTI can result in renal scarring and loss of renal reserve,[46] protection against UTI in these children is critical. Prenatal identification of high-grade hydronephrosis has been associated with vesicoureteral reflux and 3-fold increase in UTIs, so such findings may warrant consideration of newborn circumcision.[47] Genetics has increasing importance in identifying those at risk for recurrent UTI. Genes have been identified that cause

Table 3. Care of the Penis

Uncircumcised
In infants, boys, and young men, the foreskin should not be forcibly retracted as it may be at varying stages of separation from the glans penis.
In infants and young boys, the visible area at the tip of the penis should be gently cleaned with warm water and, if soap is used, it should be a mild soap.
Talcum powder should be avoided as particles could get trapped under the foreskin and cause irritation.
After cleansing, the entire area should be dried before clothing is put on.
Circumcised
The anesthetic will wear off 30 to 60 minutes after the circumcision, and the infant may be fussy.
Options to offer comfort include:
Cuddle/hold infant; nurse infant
Rock/sing to the infant; play relaxing music
Avoid putting pressure on the penis
Check the diaper every 2 to 3 hours. If wet or dirty, change it promptly. Put diapers on loosely
The infant may have pain when urinating when healing skin comes in contact with urine
The penis should improve by 7 to 10 days after the circumcision
Call health professional if there is:
Urine dripping from the penis
Redness, pain, or swelling after the first several days
Fever
Instructions for specific circumcision procedures
Plastibell method:
Petroleum jelly can be put on the ring after cleaning
Ring should fall off 4 to 10 days after the circumcision. There should not be any attempts to remove Plastibell ring as bleeding may result
Clean the penis by gentle washing with water 3 times daily or during diaper changes
Mogen method:
Keep gauze and petroleum dressing in place for the first 48 hours after the circumcision
Clean the penis by gentle washing with water 3 times daily or during diaper changes

Sources: Hunter,[30] Brown-Trask et al,[31] and the Kaiser Permanente Medical Group.[32]

inefficient bacterial clearance and greater susceptibility to UTIs.[48] Syndromes in which there are genital tract anomalies, most prominently, vesicoureteral reflux, may increase the risk for recurrent UTI.[49]

In summary, male circumcision reduces the incidence of UTI, but there is also a natural decline in prevalence of UTI in uncircumcised boys over time as the prepuce becomes more retractable. As a part of counseling, clinicians should provide education on care of the foreskin (Table 3).[30–32] Although circumcision appears to reduce the prevalence of UTIs in general, the procedure of circumcision has a reported median frequency of any complication of 1.5%,[26] which is similar to the incidence of UTI in low-risk boys.[19,21] Therefore, it appears that the net clinical benefit of circumcision is more important in boys at high risk of recurrent UTI.

HIV Transmission

Since the 1980s, evidence from more than 30 observational studies suggests that male circumcision has a protective effect against heterosexual transmission of HIV infection in men.[50,51] In 2005 and 2006, this was substantiated in 3 large randomized controlled trials with more than 10,000 men in Uganda, South Africa, and Kenya. Men who were HIV negative and aged 18 to 24[2,3] or 15 to 49[4] years were randomized to circumcision on enrollment (intervention) or at 21 to 24 months (control). All 3 trials demonstrated significant reductions of 50% to 60% in HIV transmission (Table 4).[2–4,52,53] Two trials were stopped at interim analysis because of the significant reductions in HIV in the intervention groups.[2,3] These results prompted the World Health Organization and Joint United Nations Program to recommend that male circumcision be made available as a key component of HIV prevention in heterosexual men.[54]

It is less clear whether circumcision confers protection from HIV acquisition among men who have sex with men. In a review of 20 observational studies (N = 71,693), the pooled effect estimate for HIV acquisition was not statistically significant (OR, 0.86; 95% CI, 0.70-1.06).[55] However, when subgroups were analyzed, the results of 7 studies of men reporting an insertive role (n = 3465) were statistically significant (OR, 0.27; 95% CI, 0.17-0.44) but not in the studies of men reporting a receptive role (3 studies; n = 1792; OR, 1.20; 95% CI, 0.63-2.29). Therefore, circumcision may offer protec-

Table 4. Male Circumcision and Acquisition of HIV and STI in Men and Transmission to Female Partners

	Ratio (95% Confidence Interval) by Study Location[a]		
	Uganda[4]	South Africa[2]	Kenya[3]
STI	N = 4996	N = 3274	N = 2784
Male protection benefit			
HIV	0.43 (0.24-0.75)[b]	0.40 (0.24-0.68)[b]	0.47 (0.28-0.78)[b]
High-risk HPV	0.65 (0.46-0.90)[c]	0.68 (0.52-0.89)[c]	
HSV-2	0.72 (0.56-0.92)[d]	0.66 (0.32-1.12)[b]	
Syphilis	1.10 (0.75-1.65)[d]		
Neisseria gonorrhoeae		0.87 (0.60-1.26)[c]	0.95 (0.68-1.34)[b]
Chlamydia trachomatis		0.56 (0.32-1.00)[e]	0.87 (0.65-1.16)[b]
Trichomonas vaginalis		0.53 (0.28-1.02)[e]	0.77 (0.44-1.36)[b]
GUD	0.53 (0.43-0.64)[c]		
Female protection benefit			
HIV	1.49 (0.62-3.57)[d]		
Bacterial vaginosis	0.60 (0.38-0.94[c]		
Trichomonas vaginalis	0.52 (0.05-0.98)[c]		
GUD	0.78 (0.63-0.97)[c]		
High-risk HPV[52]	0.72 (0.60-0.85)[c]		

Abbreviations: GUD, genital ulcer disease; HIV, human immunodeficiency virus; HPV, human papillomavirus; HSV-2, herpes simplex virus type 2; STI, sexually transmitted infection.
[a]The data shown are from publications of 3 randomized controlled trials by Gray et al,[4] Auvert et al,[2] and Bailey et al[3] that presented the efficacy of male circumcision. Wawer et al[52] showed high-risk HPV prevalence in a cohort of the female partners (N = 1032) of the men in the Ugandan study by Gray et al.[4]
All ratios are adjusted (except for South African HSV-2 and Kenyan bacterial STIs) and represent an intention-to-treat analysis.
[b]The ratio expressed is an incidence rate ratio.
[c]The ratio expressed is a prevalence rate ratio.
[d]The ratio expressed is a hazard ratio.
[e]The ratio expressed is an odds ratio.
Adapted with permission of Aaron A. R. Tobian, MD, PhD.[53]

tion for men practicing insertive sex, but its overall role in men who have sex with men is yet to be determined.

The findings from the African studies where HIV prevalence is high (in Kenya, Uganda, and South Africa, it ranges from 6.3% to 17.8%)[56] have been criticized as not being applicable to the United States, where the overall prevalence of HIV infection is low (0.27%) and where HIV is most often transmitted by men who have sex with men.[57] However, the heterogeneity of the US population compels attention to groups at particular risk. For example, African Americans have almost 6 times more HIV infections (0.95%) than whites (0.14%)[57] and, although representing only 14% of the US population, had the largest proportion (44%) of new HIV infections in 2009.[58] In a retrospective analysis of 40,571 visits in Baltimore sexually transmitted infection clinics, among the 394 visits by heterosexual men with known HIV exposure, circumcision was associated with a 51% reduction in HIV prevalence after adjustment for demographic and behavioral characteristics (10.2% vs 22.0%; adjusted prevalence rate ratio [aPRR], 0.49; 95% CI, 0.26-0.93).[59]

In summary, in the absence of an HIV vaccine, circumcision is one aspect of the global strategy to reduce new HIV infections,[54] specifically those associated with heterosexual transmission, and to decrease health care costs related to the burden of HIV care particularly in low-resource, high-prevalence countries.[60] In the United States, where HIV prevalence is low, circumcision may have a role in heterosexual acquisition of HIV in higher-risk subgroups but should not be viewed as a substitute for practices well known to reduce HIV such as condom use and avoidance of risky sexual behaviors.

Human Papillomavirus

Human papillomavirus (HPV) has been established as the leading cause of invasive cervical cancer in women and is associated with anogenital warts and cancers in men.[61] Two of the African trials[2,4] (Table 4) reported that circumcision was associated with an estimated 66% reduced occurrence of high-risk HPV virus in men. In another study, decreased prevalence of high-risk HPV was found in Ugandan women whose partners were circumcised immediately (27.8%) compared with women with partners who were circumcised 24 months after enrollment (38.7%, $P = .001$).[52] Although the 28% reduction in high-risk HPV observed in women whose partners were circumcised was significant, the more clinically important effect on progression to high-grade cervical dysplasia is not known.

Two recent reviews and meta-analyses analyzed the effect of male circumcision on genital HPV infection in men.[62,63] Albero et al[62] (21 studies; N = 14382) reported that circumcision was associated with a 43% reduction in both low- and high-risk subtypes of HPV (OR, 0.57; 95% CI, 0.42-0.77) and a 33% reduction in high-risk HPV (OR, 0.67; 95% CI, 0.54-0.82). However, no associations were found in the acquisition of new HPV infections, genital HPV clearance, or

Table 5. Summary of Counseling Points for Parents Seeking Advice on Male Circumcision

Male circumcision is done for: 1) religious or cultural practice, 2) medical indication, or 3) as a prophylactic measure against infections or disease.[6]

Male circumcision is not routinely recommended, but parents need to understand the circumstances in which it may be beneficial for prevention of disease as well as complications associated with the procedure.

Potential Risks of Male Circumcision

Male circumcision is a surgical procedure and therefore may be associated with bleeding, infection, or inadequate skin removal.[27]

In newborns, complications occur about 1.5% of the time. Most complications are minor such as bleeding and are easily treated.[26]

The occurrence and severity of complications depend on the clinician's skill and level of training, cleanliness of conditions, and choice of circumcision method used.[26–28]

Complications of male circumcision are lowest when they are performed by an experienced provider and when done neonatally or early in infancy.[26]

Parents who are Orthodox Jewish should be advised against the practice of *metzitzah b'peh,* as this can expose the newborn to oral HSV.[39]

Potential Health Benefits of Male Circumcision

Urinary tract infection (UTI)

Most boys are at low risk (1%-2%) for UTI.[19,40] Although male circumcision affords protection against UTI, it is also important to know that the prevalence of UTIs naturally declines in uncircumcised boys over time with the physiologic retraction of the foreskin.[14,19,22]

In boys with a condition called vesicourethral reflux, UTIs are much more common (10% to 30%), and circumcision reduces recurrence of infection and may help to protect kidneys from damage.[45,46]

HIV

In Africa, where in some areas up to 20% of the population is infected with HIV,[56] 3 large studies showed that male circumcision reduced heterosexual transmission of HIV by 50% to 60%.[2–4]

In the United States, the prevalence of HIV is very low in the population overall (0.27%), and most cases of HIV are transmitted by men having sex with men.[57]

It is less clear if male circumcision confers protection from HIV acquisition in men who have sex with men; although it may offer protection for men practicing insertive sex.[55]

Male circumcision may be beneficial in groups in the United States who have disproportionately higher rates of HIV. For instance, one study of heterosexual African American men in the United States who were circumcised were 50% less likely to be infected with HIV than those who were not circumcised.[59]

Human papillomavirus (HPV)

Certain HPV strains cause cervical cancer in women and genital warts or cancers in men.[61]

Male circumcision decreases HPV occurrence in men and thereby decreases transmission to women.[62,63]

Herpes simplex virus (HSV)

Herpes simplex virus infection is not only a painful sexually transmitted infection but is also associated with higher risk of HIV infection.[65]

In the United States, HSV is common: 16% overall and almost 40% in some groups.[69] Male circumcision reduced HSV in men by 28%[4] and theoretically would reduce transmission of HSV to female partners, which would also decrease neonatal HSV.[70]

Bacterial vaginosis (BV) and *Trichomonas vaginalis*

Women in the Ugandan randomized controlled trial had a 40% reduction in any BV and a 61% reduction in severe BV and were 48% less likely to have *Trichomonas vaginalis* if their partners were circumcised.[4,73]

Penile cancer

Penile cancer is rare in developed countries like the United States.[76]

Male circumcision has a strong protective effect against penile cancer[25] as do use of condoms, smoking cessation, and the HPV vaccine.[78]

Additional points

Counseling should include comfort measures after circumcision and care of the circumcised or uncircumcised penis.[30–32]

Male circumcision is a painful procedure. The preferred method to minimize pain is to choose a provider who is skilled in the use of a dorsal penile nerve block.[15,79]

Changes in sexual function or satisfaction after male circumcision were not reported in the large randomized controlled trials in Africa by men or their female partners.[81]

Continued.

Table 5. Summary of Counseling Points for Parents Seeking Advice on Male Circumcision

One large Danish study reported that sexual function overall did not differ between circumcised and uncircumcised men. However, after adjusting for factors such as age, circumcised men were more likely to report frequent orgasm difficulties. Women with circumcised spouses reported more incomplete sexual needs fulfillment and more frequent overall sexual function difficulties, orgasm difficulties, and dyspareunia. However, in Denmark, male circumcision is rare; only 5% of the men in the study were circumcised (as newborns), and only 3.7% of the women had partners who were circumcised.[18]
In resource-rich countries, promotion of safe sexual practices and HPV vaccination reduces HIV, HPV, penile cancer, and other sexually transmitted infections.

genital warts.[62] Larke et al[63] (27 studies; N = 10,779) also reported that circumcision was associated with a reduction in HPV (summary RR, 0.75; 95% CI, 0.57-0.99) and no evidence of an association with genital warts (OR, 0.93; 95% CI, 0.65-1.33). However, in contrast to Albero et al,[62] Larke reported increased HPV clearance (summary RR, 1.33; 95% CI, 0.89-1.98).

In the United States, only 1% of males complete the HPV vaccine series.[64] Although the 33% reduction in high-risk HPV prevalence[62] and the 33% increase in HPV clearance[63] are noteworthy, clinicians should promote the use of HPV vaccinations and encourage safe sexual practices to reduce HPV transmission.

Other Sexually Transmitted Infections

Male circumcision may have a role in the acquisition of other sexually transmitted infections. Although circumcision has not been directly associated with decreases in HIV transmission to female partners,[4] it is still important to understand whether circumcision affects ulcerative sexually transmitted infections such as HSV type 2[65,66] and syphilis,[66,67] both of which are associated with an increased risk of HIV. The Ugandan study[4] reported that circumcision was associated with 28% fewer HSV-2 seroconversions over 2 years; 10.3% in the uncircumcised men and 7.8% in circumcised men, whereas the South African study[2] suggested a reduction in HSV (Table 4). However, when the South African data were evaluated for HSV-2 acquisition among both HIV-negative and HIV-positive men, circumcision was associated with 34% fewer HSV-2 cases (RR, 0.66; 95% CI, 0.39-0.94).[68] Thus, 2 independent randomized trials documented decreases in HSV-2 acquisition associated with circumcision ranging from 28% to 34%.

In the United States, the prevalence of HSV (16.2%) is higher than that reported in the African studies. Further, as HSV disproportionately affects African American men (39.2%) and women (48.0%),[69] and because HSV infections in the neonatal period are associated with significant morbidity and death,[70] circumcision may afford important benefit in terms of reductions in HSV infections, particularly in female partners in their childbearing years.

It is less clear whether circumcision reduces the risk of acquiring syphilis. In a systematic review of 14 observational studies conducted prior to the African studies, authors reported a 33% reduction in syphilis among circumcised men (summary RR, 0.67; 95% CI, 0.54-0.83), whereas more recent data from 2 Ugandan trials reported no difference in the incidence of syphilis in circumcised men (adjusted hazard ratio [aHR], 1.10; 95% CI, 0.75-1.65; $P = .44$).[4,66]

Male circumcision does not consistently appear to reduce the acquisition of sexually transmitted gonorrhea, chlamydia, and trichomonas in men, but there is some evidence of reductions in women partners. In the South African[2] and Kenyan[3,71] studies (Table 2), circumcision did not demonstrate significant reductions in gonorrhea, chlamydia, and trichomonas among men. With respect to transmission to women, a prospective cohort study (N = 5925) of women from Uganda, Zimbabwe, and Thailand similarly reported no reductions in gonorrhea, chlamydia, and trichomonas.[72] However, the women in the Ugandan studies[4,73] were 48% less likely to have trichomonas if their partners were circumcised, and pooled data from multinational studies reported that women (n = 300) with circumcised partners had an 82% lower risk of chlamydia (OR, 0.18; 95% CI, 0.05 to −0.58; $P = .004$) compared with those whose partners were uncircumcised.[74]

Male circumcision appears to reduce bacterial vaginosis in women. The Ugandan trials[4,73] demonstrated a 40% reduction in any bacterial vaginosis (aPRR, 0.60; 95% CI, 0.38-0.94; Table 4) and a 61% reduction in severe bacterial vaginosis (aPRR, 0.39; 95% CI, 0.24-0.64) in women whose partners were circumcised. In a longitudinal study of factors associated with bacterial vaginosis, women who had intercourse with an uncircumcised partner in the prior 4 months were twice as likely (HR, 1.9; 95% CI, 1.0-3.5; $P = .04$) to have bacterial vaginosis than those who had only circumcised partners and were almost 3 times more likely (HR, 2.7; 95% CI, 2.1-3.6; $P < .001$) to have bacterial vaginosis if they had been seropositive for HSV-2 on a prior visit.[75] This suggests that circumcision not only has a protective effect for women acquiring bacterial vaginosis but also is consistent with the known increased risk for other sexually transmitted infections when genital ulcerative disease is present.

In summary, there is substantive evidence that male circumcision reduces male acquisition of HSV-2, an infection that is not only prevalent in the United States but is also associated with morbidity in adults and with disability and death in neonates. There is also evidence, although not as consistent, that circumcision reduces bacterial vaginosis and trichomonas in women. Therefore, circumcision could confer protective benefit later in life, specifically to the son's partner during childbearing, as HSV, bacterial vaginosis, and trichomonas are associated with increased perinatal morbidity.

Penile Cancer

Penile cancer is rare in developed countries. In the United States the rate is 0.7 per 100,000 men per year, with Hispanic men slightly higher at 1.3 per 100,000.[76] Factors associated with penile cancer include cigarette smoking, HPV infection, poor penile hygiene, penile inflammation, and phimosis.[77] A review of 8 studies reported that childhood or adolescent circumcision protected against invasive penile cancer (OR, 0.33; 95% CI, 0.13-0.83).[25] However, as penile cancer is rare and caused by HPV in 40% of all cases (mostly from HPV subtypes 16 and 18),[78] it is more logical to promote preventive practices such as smoking cessation, condom use, HPV vaccination, and penile hygiene.

PAIN AND NEWBORN MALE CIRCUMCISION

An aspect of counseling that must be addressed is whether circumcision is associated with procedural or postoperative pain. The prepuce, or foreskin, has somatosensory innervation by the dorsal nerve of the penis and branches of the perineal nerve as well as autonomic innervation from the pelvic plexus.[15] A Cochrane review of 35 trials of newborns (N = 1997) concluded that although dorsal penile nerve block was more effective for circumcision pain than the placebo and eutectic mixture of analgesics, none of the interventions completely eliminated the pain response to circumcision.[79] Comfort measures for newborns who have been circumcised are presented in Table 3.

SEXUAL DYSFUNCTION

Changes in penile sensation or later sexual dysfunction after the more commonly done procedure of newborn circumcision are unstudied, and studies done of sexual functioning in older boys and men with circumcision have had conflicting results. Subjective and physiologic measures were used to compare uncircumcised with circumcised men (n = 40) who underwent genital and nongenital sensory testing at baseline and in response to erotic and control stimulus films. Uncircumcised men experienced a higher change in penile temperature with exposure to the erotic film than circumcised men ($F_{1,36} = 7.48$, $P = .01$), but no differences in genital sensitivity were found between the 2 groups.[80]

A cohort of Danish men and women (N = 5552) provided data on whether they were circumcised or had a circumcised partner and on aspects of their sex lives.[18] Sexual function overall did not differ between the 2 groups of men. However, after adjusting for factors such as age, circumcised men were more likely to report frequent orgasm difficulties (aOR, 3.26; 95% CI, 1.42-7.47). Women with circumcised spouses reported more incomplete sexual need fulfillment (38% vs 28%; aOR, 2.09; 95% CI, 1.05-4.16), frequent overall sexual function difficulties (31% vs 22%; aOR, 3.26; 95% CI, 1.15-9.27), orgasm difficulties (19% vs 14%; aOR, 2.66; 95% CI, 1.07-6.66), and dyspareunia (12% vs 3%; aOR, 8.45; 95% CI, 3.01-23.74). Study limitations were its basis in self-report, the small percentages of men who were circumcised (5.3%) and women with circumcised partners (3.7%), and lack of precircumcision experience (the men were circumcised as newborns). Further, the potential for cultural bias must be considered when conducting this type of survey in a country in which circumcision is rare.

In contrast, men in the Ugandan randomized controlled trial[81] reported no differences in sexual satisfaction and function before randomization. Initially after circumcision, men in the circumcised group had difficulty with penetration. By 6 months, there was no difficulty with penetration in 98.6% of circumcised men and 99.4% of controls ($P = .02$) and no pain on intercourse in 99.4% of circumcised and 98.8% of uncircumcised men ($P = .05$). Sexual satisfaction increased from 98.0% at enrollment to 99.9% at 2 years among the controls ($P < .001$), but there was no change in satisfaction among circumcised men (enrollment, 98.5%; 2 years, 98.4%; $P = .8$). Of the female partners (n = 455), 2.9% reported less sexual satisfaction after their partners were circumcised, whereas 57.3% reported no change and 39.8% reported improvement in sexual satisfaction after their partner's circumcision.[82] It is unclear if the women in the study knew of the potential protective effect of circumcision, but if this had been known, it could have biased them to feel less worried/more satisfied with sexual experiences.

In summary, the effect of newborn circumcision on sexual functioning is not clear. In the Ugandan study, circumcision was performed on adult men and thereby allowed comparison of sexual function pre- and postcircumcision. In contrast, men in the Danish study were circumcised as newborns, and this precluded comparison with sexual function prior to circumcision.

ETHICAL CONSIDERATIONS

Clinicians must be willing to present the ethical issues regarding newborn male circumcision. Neonatal circumcision is a form of nonconsensual surgery and therefore could be seen as a violation of autonomy. However, parents regularly practice proxy decision making for their children when choosing other preventive or corrective interventions (eg, vaccinations, orthodontia). It can be argued that compared with adult circumcision, newborn circumcision is less risky and theoretically may provide health benefits earlier in life.[28,83] Another ethical aspect is that the right to choose newborn circumcision is compromised by it not being equally available given that reimbursement is more often available from private sector insurance than from Medicaid.[84] Therefore, it would be beneficial for clinicians to be familiar with the statewide insurance coverage for circumcision and to be aware of reputable health professionals who provide circumcision.

SUMMARY

In countries that lack HPV vaccine, cervical cancer screening, and other health resources, population-based availability of circumcision is critical to reducing the health burden of HIV, HPV, and other sexually transmitted infections. However, when counseling parents in a resource-rich health environment like the United States, it is the role of clinicians to provide unbiased information on the health benefits and risks of newborn circumcision while reinforcing the need for condom use, vaccination, and avoidance of risky sexual behavior. Table 5 summarizes aspects of counseling to be provided in an educational, nonbiased manner so that the parents can

determine if newborn circumcision is appropriate for their boys. Finally, clinicians must have a basic understanding of and appreciation for viewpoints that support or oppose circumcision so that information is provided not only factually, but respectfully.

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CONFLICT OF INTEREST

The author has no conflicts of interest to disclose.

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