ABSTRACT. Existing scientific evidence demonstrates potential medical benefits of newborn male circumcision; however, these data are not sufficient to recommend routine neonatal circumcision. In circumstances in which there are potential benefits and risks, the procedure is not essential to the child’s current well-being, parents should determine what is in the best interest of the child. To make an informed choice, parents of all male infants should be given accurate and unbiased information and be provided the opportunity to discuss this decision. If a decision for circumcision is made, procedural analgesia should be provided.

The percentage of male infants circumcised varies by geographic location, by religious affiliation, and, to some extent, by socioeconomic classification. Circumcision is uncommon in Asia, South America, Central America, and most of Europe. In Canada, ~48% of males are circumcised. Some groups such as followers of the Jewish and Islamic faiths practice circumcision for religious and cultural reasons.

There are few data to help estimate accurately the number of newborn males circumcised annually in the United States. According to the National Center for Health Statistics (NCHS), 64.1% of male infants were circumcised in the United States during 1995 (unpublished data, 1997). However, data from the NCHS are based on voluntary collection of data from participating hospitals; <5% of hospitals in the United States participate. Thus, NCHS data provide an inadequate sample to estimate national circumcision frequency.

More specific data on circumcision rates are >1 decade old. Data obtained from hospital records in metropolitan Atlanta, GA, document circumcision rates of 84% to 89% in the period 1985 to 1986. This study demonstrated that hospital discharge data, which rely on medical record face sheet information, underestimate the true incidence of neonatal circumcision. Using such hospital discharge data, it was estimated that 45.5% of male infants born in New York City and 69.6% of male infants born elsewhere in New York State were circumcised at birth during the year 1985. In addition, none of these sources included rates for ritual circumcision or subsequent outpatient procedures, thus, these rates of circumcision are even more likely to be underestimated.

Differences in circumcision rates related to demographic variables are not well described. One study, which surveyed adult men, suggested that in the United States, the frequency of circumcision varies

ABBREVIATIONS. UTI, urinary tract infection; STD, sexually transmitted disease; NCHS, National Center for Health Statistics; DPNB, dorsal penile nerve block; SCCP, squamous cell carcinoma of the penis; HPV, human papilloma virus; HIV, human immunodeficiency virus.
directly with maternal education, a marker for socioeconomic status. Circumcision rates also vary among racial and ethnic groups, with whites considerably more likely to be circumcised than blacks or Hispanics (81% vs 65% or 54%).

**EMBRYOLOGIC AND ANATOMIC CONSIDERATIONS**

Embryologically, the penis glans derives from the genital tubercle, which has developed by 4 to 6 weeks’ gestation. The primitive urethral folds present in the male human embryo fuse to form the penile urethra. The genital swellings, present early in development, subsequently become the scrotum in males. The skin of the body of the penis begins growing forward at about 8 weeks’ gestation and covers the glans eventually. Initially, squamous epithelium has no separation between the glans and the foreskin. Separation of epithelial layers that may be only partially complete at birth progress with the development of desquamated tissue in pockets until the complete separation of tissue layers forms the preputial space. As a result of this incomplete separation, the prepuce or foreskin may not be fully retractable until several years after birth. In ~90% of uncircumcised males, the foreskin is retractable by age 5 years. Partial adhesions with smegma accumulation may persist in small numbers of uncircumcised men. The skin of the foreskin is particularly thick at the base near the meatus and thins as it connects with the genital skin. The only longitudinal study to address this issue in both circumcised and uncircumcised boys followed a birth cohort of 500 New Zealand boys until the age of 8 years; it was noted that the relationship between risks of penile problems and circumcision status varied with the child’s age. The majority of these problems were described as penile inflammation and were noted to be relatively minor. In this study, circumcised infant boys had a significantly higher rate of penile problems (such as balanitis) than did uncircumcised boys, whereas, after infancy, the rate of penile problems (such as balanitis and inflammation of the foreskin) were significantly higher in older uncircumcised boys.

A retrospective survey conducted at two inner city clinics asked parents of boys 4 months to 12 years of age to recall whether their sons had ever developed anejun penile problems. Hispanic parents constituted 73% of those responding. Although parents of uncircumcised boys reported an increased number of medical visits for penile problems, the frequency of balanitis and irritation was not significantly different between circumcised and uncircumcised boys.

In addition, most of the problems reported were minor. Case reports suggest an increased frequency of paraphimosis in uncircumcised elderly men who require intermittent or chronic bladder catheterization. Other case reports indicate that balanitis occurs more frequently in uncircumcised men than in circumcised men and suggest an increased frequency of balanitis in men with diabetes and in uncircumcised soldiers during wartime. Chronic inflammation of the foreskin may result in a secondary phimosis caused by scarring. Medical therapy has been successful in resolving both secondary phimosis and paraphimosis, but surgical intervention is sometimes indicated.

**THE ROLE OF HYGIENE**

Circumcision has been suggested as an effective method of maintaining penile hygiene since the time of the Egyptian dynasties, but there is little evidence to affirm the association between circumcision status and optimal penile hygiene.

In one study, appropriate hygiene decreased significantly the incidence of phimosis, adhesions, and inflammation, but did not eliminate all problems. In this study, 60% of parents remembered receiving instructions on the care of the uncircumcised penis, and most followed the advice they were given. Various studies suggest that genital hygiene needs to be emphasized as a preventive health topic throughout a patient’s lifetime.

**SEXUAL PRACTICE, SENSATION, AND CIRCUMCISION STATUS**

A survey of adult males using self-report suggests more varied sexual practice and less sexual dysfunction in circumcised adult men. There are anecdotal reports that penile sensation and sexual satisfaction are decreased for circumcised males. Masters and Johnson noted no difference in exteroceptive and light tactile discrimination on the ventral or dorsal surfaces of the glans penis between circumcised and uncircumcised men.

**METHODS OF CIRCUMCISION**

There are three methods of circumcision that are commonly used in the newborn male. These all include the use of devices: the Gomco clamp, the Plastibell device, and the Mogen clamp (or variations derived from the same principle on which each of these devices is based).

The elements that are common to the use of each of these devices to accomplish circumcision include the following: estimation of the amount of external skin
to be removed; dilation of the preputial orifice so that the glans can be visualized to ensure that the glans itself is normal; bluntly freeing the inner preputial epithelium from the epithelium of the glans; placing the device (at times a dorsal slit is necessary to do so); leaving the device in situ long enough to produce hemostasis; and amputation of the foreskin.

It is important that those who practice circumcision become sufficiently skilled at the technical aspects of the procedure so that complications can be minimized. Those performing circumcision should be adept at suturing to ensure that hemostasis can be secured when necessary and that skin edges can be brought together if they should separate widely. If circumcision is done in the newborn period, it should be performed only on infants who are stable and healthy.

**COMPLICATIONS OF THE CIRCUMCISION PROCEDURE**

The true incidence of complications after newborn circumcision is unknown. Reports of two large series have suggested that the complication rate is somewhere between 0.2% and 0.6%. Most of the complications that do occur are minor. The most frequent complication, bleeding, is seen in ~0.1% of circumcisions. It is quite rare to need transfusion after a circumcision because most bleeding episodes can be handled quite well with local measures (pressure, hemostatic agents, cautery, sutures). Infection is the second most common of the complications, but most of these infections are minor and are manifest only by some local redness and purulence. There also are isolated case reports of other complications such as recurrent phimosis, wound separation, concealed penis, unsatisfactory cosmesis because of excess skin, skin bridges, urinary retention, meatitis, mental stenosis, chordee, inclusion cysts, and retained Plastibell devices. Case reports have been noted associating circumcision with such rare events as scalded skin syndrome, nectrotizing fasciitis, sepsis, and meningitis, as well as with major surgical problems such as urethral fistula, amputation of a portion of the glans penis, and penile necrosis.

**CIRCUMCISION AFTER THE NEWBORN PERIOD**

Should circumcision become necessary after the newborn period because problems have developed, general anesthesia is often used and requires a more formal surgical procedure necessitating hemostasis and suturing of skin edges. Although the procedural complications are generally the same as those of newborn circumcision, there is the added risk attendant to general anesthesia if it is used. Additionally, there is morbidity in the form of time lost from school or work to be considered.

**ANALGESIA**

There is considerable evidence that newborns who are circumcised without analgesia experience pain and physiologic stress. Neonatal physiologic responses to circumcision pain include changes in heart rate, blood pressure, oxygen saturation, and cortisol levels. One report has noted that circumcised infants exhibit a stronger pain response to subsequent routine immunization than do uncircumcised infants. Several methods to provide analgesia for circumcision have been evaluated.

**Eutectic Mixture of Local Anesthetics (EMLA Cream)**

EMLA cream, containing 2.5% lidocaine and 2.5% prilocaine, attenuates the pain response to circumcision when applied 60 to 90 minutes before the procedure. Compared with placebo groups, neonates who had EMLA cream applied spend less time crying and have smaller increases in heart rate during circumcisions. The analgesic effect is limited during the phases associated with extensive tissue trauma such as during lysis of adhesions and tightening of the clamp. Ideally, 1 to 2 g of EMLA cream is applied to the distal half of the penis, which then is wrapped in an occlusive dressing. There is a theoretic concern about the potential for neonates to develop methemoglobinemia after the application of EMLA cream, because a metabolite of prilocaine can oxidize hemoglobin to methemoglobin. When measured, blood levels of methemoglobin in neonates after the application of 1 g of EMLA cream have been well below toxic levels. Two cases of methemoglobinemia in infants occurred after 3 g of EMLA cream was applied; in 1 of these cases, the infant also was receiving sulfamethoxazole. EMLA cream should not be used in neonates who are receiving other drugs known to induce methemoglobinemia.

**Dorsal Penile Nerve Block (DPNB)**

DPNB is very effective in reducing the behavioral and physiologic indicators of pain caused by circumcision. Compared with control subjects who received no analgesia, neonates with DPNB cry 45% to 76% less, have 34% to 50% smaller increases in heart rate, and have smaller decreases in oxygen saturation during the procedure. Additionally, DPNB attenuates the adrenocortical stress response compared with control subjects who received no injections or injections of saline. The technique of Kirya and Werthmann is used most commonly to perform the block. A 27-gauge needle is used to inject the 0.4 mL of 1% lidocaine, to be administered at both the 10- and 2- o’clock positions at the base of the penis. The needle is directed posteroomedially 3 to 5 mm on each side until Buck’s fascia is entered. After aspiration, the local anesthetic is injected. Systemic lidocaine levels obtained with use of this technique demonstrated peak concentrations at 60 minutes, well below toxic ranges. Several studies evaluating the efficacy of DPNB reported bruising as the most frequent complication. Hematomas were rarely seen and caused no long-term injury. A single report of penile necrosis may have been secondary to the surgical technique rather than to the DPNB.

**Subcutaneous Ring Block**

A subcutaneous circumferential ring of 0.8 mL of 1% lidocaine without epinephrine at the midshaft of the penis was found to be more effective than EMLA.
cision rates varied from low (found in samples from populations in which circumcised male infants compared with that in circumcised three to seven times increased risk of UTI in uncircumcised infants had a 12.0-fold increased risk for infant boys.) The number is similar to the rates of 0.7% to 1.4% reported for uncircumcised males in the United States and Canada. Although these cross-cultural data do not provide information on specific individual risk factors, the similarity of European and American UTI rates for uncircumcised male infants support an association between circumcision status and UTI. Using these rates and the increased risks suggested from the literature, one can estimate that 7 to 14 of 1000 uncircumcised male infants will develop a UTI during the first year of life, compared with 1 to 2 of 1000 circumcised male infants.

Although all these studies have shown an increased risk of UTI in uncircumcised male infants, it is difficult to summarize and compare the results because of differences in methodology, samples of infants studied, determination of circumcision status, method of urine collection, UTI definition, and assessment of confounding variables. Furthermore, in some studies, methods for determining the reliability of the data were not described.

Few of the studies that have evaluated the association between UTI in male infants and circumcision status have looked at potential confounders (such as prematurity, breastfeeding, and method of urine collection) in a rigorous way. For example, because premature infants appear to be at increased risk for UTI,75–77 the inclusion of hospitalized premature infants in a study population may act as a confounder by suggesting an increased risk of UTI in uncircumcised infants. Premature infants usually are not circumcised because of their fragile health status.78

In another example, breastfeeding was shown to have a threefold protective effect on the incidence of UTI in a sample of uncircumcised infants. However, breastfeeding status has not been evaluated systematically in studies assessing UTI and circumcision status.79

One study suggested that the method used to obtain urine for culture may influence the rate of infection,41 with the greatest risk for infection noted in uncircumcised male infants who had samples obtained by catheterization, compared with those who had samples obtained by suprapubic aspiration. The three methods of urine collection in male infants (suprapubic aspiration vs catheterization vs bag) vary significantly in their accuracy of diagnosing UTI. Suprapubic aspiration is considered the “gold standard” but may not be used in clinical practice for reasons of parent and physician preference as well as for efficiency.80,81 No studies addressing the associa-
tion between UTI and circumcision status have used suprapubic aspiration exclusively; one study, however, did use suprapubic aspiration in 92% of urine collections and noted a 10-fold increased risk of UTI in uncircumcised male infants compared with circumcised infants. There are no studies comparing urine obtained by suprapubic aspiration and urethral catheterization in uncircumcised males. In the only study comparing the accuracy of catheterization and suprapubic aspiration in a sample of 35 asymptomatic boys (1 uncircumcised, 28 circumcised, and 6 with circumcision status not reported), the one false-positive urine sample with significant bacterial growth was obtained by catheterization of a 1-year-old uncircumcised male. A study in newborns demonstrated that urine sample obtained by bag technique is inadequate for diagnosing UTI in an uncircumcised male because of the high false-positive rate; however, a negative bagged urinalysis and culture makes the diagnosis of UTI unlikely.

There is a biologically plausible explanation for the relationship between an intact foreskin and an increased association of UTI during infancy. Increased periurethral bacterial colonization may be a risk factor for UTI. During the first 6 months of life, there are more uropathogenic organisms around the urethral meatus of uncircumcised male infants than around that of circumcised male infants, but this colonization decreases in both groups after the first 6 months. In addition, it was demonstrated in an experimental preparation that uropathogenic bacterial adhered to and readily colonized the keratinized surface of the foreskin, but did not adhere to the keratinized skin surface of the foreskin.

In children, UTI usually necessitate a physician visit and may involve the possibility of an invasive procedure and hospitalization. Studies on the morbidity and mortality associated with UTI in infancy have been confused by the inclusion of high-risk neonates and those with congenital anomalies. The evidence that does exist suggests that the incidence of bacteremia associated with UTI occurs primarily during the first 6 months of life and is inversely related to age. Although the overall incidence of bacteremia associated with UTI is 2% to 10% during the first 6 months of life, it has been noted to be as high as 21% in the neonatal period. Symptomatic UTI in infancy is considered to be a marker for congenital anomalies of the genitourinary tract; however, not all infants who have UTI will have abnormal radiologic findings. A published review suggests that the majority of children with UTI will have normal radiographic examination results. There is a lack of information on the sequelae of UTI in infants with a normal genitourinary system.

There may be a relationship between young age at first symptomatic UTI and subsequent renal scar formation. Similarly, there may be a relationship between young age (≤3 years) at first episode of pyelonephritis and decreased glomerular filtration rate. However, the relationship between renal scar formation and renal function is not well defined, and the long-term clinical significance of renal scars remains to be demonstrated.

Data from multiple studies suggest that uncircumcised male infants are perhaps as much as 10 times more likely than are circumcised male infants to experience a UTI in the first year of life. This means that an uncircumcised male infant has an approximate 1 in 100 chance of developing a UTI during the first year of life; a circumcised male infant has an approximate 1 in 1000 chance of developing a UTI during the first year of life. Published data from a population-based cohort study of 58,000 Canadian infants suggest an increased risk of UTI in uncircumcised male infants of lower magnitude than data from previous studies. Using data from this study, an uncircumcised male infant has a 1 in 140 chance of being hospitalized for a UTI during the first year of life; a circumcised male infant has an approximate 1 in 530 chance of being hospitalized for a UTI during the first year of life.

In summary, all studies that have examined the association between UTI and circumcision status show an increased risk of UTI in uncircumcised males, with the greatest risk in infants younger than 1 year of age. The magnitude of the effect varies among studies. Using numbers from the literature, one can estimate that 7 to 14 of 1000 uncircumcised male infants will develop a UTI during the first year of life, compared with 1 to 2 of 1000 circumcised male infants. Although the relative risk of UTI in uncircumcised male infants compared with circumcised male infants is increased from 4- to as much as 10-fold during the first year of life, the absolute risk of developing a UTI in an uncircumcised male infant is low (at most, ~1%).

CIRCUMCISION STATUS AND CANCER OF THE PENIS

Cancer of the penis is a rare disease; the annual age-adjusted incidence of penile cancer is 0.9 to 1.0 per 100,000 males in the United States. In countries where the overwhelming majority of men are uncircumcised, the rate of penile cancer varies from 0.82 per 100,000 in Denmark to 1.8 to 8.6 per 100,000 in Brazil and 2.0 to 10.5 per 100,000 in India. The literature on the relationship between circumcision status and risk of squamous cell carcinoma of the penis (SCCP) is difficult to evaluate. Reports of several case series have noted a strong association between uncircumcised status and increased risk for penile cancer; however, there have been few rigorous hypothesis-testing investigations. SCCP exists in both preinvasive (carcinoma in situ) and invasive forms. Precancerous SCCP lesions and in situ SCCP often occur primarily on the shaft of the penis, whereas invasive SCCP may be more likely to involve the glans. It is unclear whether preinvasive and invasive forms of SCCP are separate diseases or whether invasive SCCP develops from preinvasive SCCP. This uncertainty makes analyzing the literature difficult. Uncircumcised status has been strongly associated with invasive SCCP in multiple case series.

The major risk factor for penile cancer across three case-control studies was phimosis. Other risk factors identified include "previous genital condition," gen-
CIRCUMCISION STATUS AND STD INCLUDING HUMAN IMMUNODEFICIENCY VIRUS (HIV)

Evidence regarding the relationship of circumcision to STD in general is complex and conflicting. Studies suggest that circumcision males may be less at risk for syphilis than uncircumcised males. In addition, there is a substantial body of evidence that links noncircumcision in men with risk for HIV infection. Genital ulcers related to STD may increase susceptibility to HIV in both circumcised and uncircumcised men, but uncircumcised status is independently associated with the risk for HIV infection in several studies. There does appear to be a plausible biologic explanation for this association in that the mucous surface of the uncircumcised penis allows for viral attachment to lymphoid cells at or near the surface of the mucous membrane, as well as an increased likelihood of minor abrasions resulting in increased HIV access to target tissues. However, behavioral factors appear to be far more important risk factors in the acquisition of HIV infection than circumcision status.

ETHICAL ISSUES

The practice of medicine has long respected an adult’s right to self-determination in health care decision-making. This principle has been operationalized through the doctrine of informed consent. The process of informed consent obligates the physician to explain any procedure or treatment and to enumerate the risks, benefits, and alternatives for the patient to make an informed choice. For infants and young children who lack the capacity to decide for themselves, a surrogate, generally a parent, must make such choices.

Parents and physicians each have an ethical duty to the child to attempt to secure the child’s best interest and well-being. However, it is often uncertain as to what is in the best interest of any individual patient. In cases such as the decision to perform a circumcision in the neonatal period when there are potential benefits and risks and the procedure is not essential to the child’s current well-being, it should be the parents who determine what is in the best interest of the child. In the pluralistic society of the United States in which parents are afforded wide authority for determining what constitutes appropriate child-rearing and child welfare, it is legitimate for the parents to take into account cultural, religious, and ethnic traditions, in addition to medical factors, when making this choice.

Physicians counseling families concerning this decision should assist the parents by explaining the potential benefits and risks and by ensuring that they understand that circumcision is an elective procedure. Parents should not be coerced by medical professionals to make this choice.

SUMMARY AND RECOMMENDATIONS

Existing scientific evidence demonstrates potential medical benefits of newborn male circumcision; however, these data are not sufficient to recommend routine neonatal circumcision. In the case of circumcision, in which there are potential benefits and risks, yet the procedure is not essential to the child’s current well-being, parents should determine what is in the best interest of the child. To make an informed choice, parents of all male infants should be given accurate and unbiased information and be provided the opportunity to discuss this decision. It is legitimate for parents to take into account cultural, religious, and ethnic traditions, in addition to the medical factors, when making this decision. Analgesia is safe and effective in reducing the procedural pain associated with circumcision; therefore, if a decision for circumcision is made, procedural analgesia should be provided. If circumcision is performed in the newborn period, it should only be done on infants who are stable and healthy.


Circumcision Policy Statement
Task Force on Circumcision

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