Below the Belt: Doctors, Debate, and the Ongoing American Discussion of Routine Neonatal Male Circumcision

Lawrence S. Dritsas
Virginia Polytechnic Institute and State University

There has been considerable controversy surrounding the routine circumcision of male infants in the United States. This is of particular concern, since the medical establishments of all the other countries of the developed world have abandoned this procedure as having dubious benefits. This article examines the medical pros and cons of neonatal male circumcision in a historical perspective and suggests that the circumstances that led to its establishment as a routine practice are largely absent today. Reasons for its continued use and ethical and moral issues associated with its practice are then examined closely, especially in light of the current debate surrounding female circumcision. The article concludes that the medical and ethical issues surrounding this practice should be more broadly debated until there is some consensus as to its benefits. Prudence dictates that until such a consensus emerges, the practice should be suspended.

This article will discuss the routine circumcision of male newborns, infants, and children in the hospitals of the United States. Currently, somewhere between 60% and 70% of males born in the United States are circumcised, typically during the first few days after birth. Because its medical benefits are uncertain and the procedure is not without risks (although they are low), this practice is exceptionally controversial. Also controversial is the fact that the routine, nonritual circumcision of baby boys is a uniquely American practice. In Gentile America, male circumcision is not a recognized mark of group membership or rite of passage as it is for many cultures on every continent. The American practice, when not necessitated by cultural traditions, manifests as an indicated medical procedure that is beneficial for the patient. It must be so, for surgeons should not remove healthy organs from minors without cause; doing so challenges a guiding principle in Western medicine: primum non nocere (first, do no harm).

I do not intend to lead an assault against the American medical establishment. There is no reason to believe that a conspiracy against the American foreskin exists. Nor do I wish to analyze the religious and cultural practices of circumcision; they have far different histories and issues surrounding their continuance. My intention is to “map out” the controversy surrounding Gentile American circumcision, listen to what each side is saying, and determine what may compel them to have the opinions they do. To achieve this goal, I have reviewed the medical literature of the past 10 years, and further when needed. However, this article will not present an intensive literature review of every scientific study performed during the past 10 years concerning circumcision, although most are present here. Excellent reviews have been published by the American Academy of Pediatrics Task Force on Circumcision (1999) and the Canadian Pediatric Society Fetus and Newborn Committee (1996). To develop their policies, the major pediatric organizations undertake exhaustive literature reviews and attempt to discern whether a consensus exists within the scientific community. Their policies are largely informed by these studies.

The framework for this article will be the policy statements given by the American Academy of Pediatrics Task Force on Circumcision. The first was released in Pediatrics, the journal of the organization, in August 1989. The second was released in March 1999. After describing the circumcision procedure and
its history in the United States, I will compare the two policy statements. How did we arrive at the 1989 statement? What changes in medical knowledge warranted a new statement to be released in 1999? To help answer these two questions and develop a context in which to consider them, I have followed circumcision over the past 10 years in a number of journals, including Pediatrics, the New England Journal of Medicine, the Journal of the American Medical Association, Lancet, and American Family Physician. Articles from other journals and outside this time period will also be used, and I have consulted historical works that deal with the practice.

Through this analysis, a small number of researchers will be prominent, and I feel they may be considered leaders in the debate because of the frequency with which they are published in the major journals. The opinions of these researchers are extremely important, and they are often cited in secondary and mass media publications. Landmark studies published by these researchers have had a significant effect on the opinions of the wider medical community. The interpretation and reinterpretation of their results are the fuel for many disagreements published in these journals’ correspondence sections.

This debate has not remained within the medical community. Numerous anti- and pro-circumcision groups have formed around the world. Their rhetoric is largely based on published medical studies and more “common sensibilities” concerning the foreskin and individual rights. Not surprising in modern times, these groups have established their presence on the Internet. These groups are the sources for numerous anecdotal accounts of circumcision procedures and opinions. They must be approached cautiously, since it is difficult to determine what type of constituency they represent; however, reviewing their publications, both electronic and paper based, can be informative for any discussion of this controversy.

Finally, I will attempt to discuss some of the ethical and moral issues relevant to the routine circumcision of male neonates. Medical necessity versus cultural tradition is a common theme here. It is also necessary to consider issues of informed consent. Because infants are unable to provide consent themselves, the medical community looks to parents or guardians for consent by proxy. However, if the medical indication for the procedure is controversial and uncertain, on what basis are parents to make their decisions? Moreover, issues surrounding male circumcision have been complicated in recent years owing to the international outcry against female circumcision. Are the two procedures comparable? Does legislation against female circumcision present a legal hypocrisy? Opinions on these issues are extremely impassioned.

Before beginning, I wish to offer a final note concerning my analysis. All too often, the boundaries drawn around a debate are created by the analysis itself. Extremely complex issues become two sided under the investigator’s scrutiny. In this study, I have attempted to avoid this outcome as much as possible, but there is little in the literature to suggest otherwise. The finality of the procedure presents us with an either/or choice. Medical practitioners are either for or against the procedure insofar as they perform it or they do not. Ambiguity may be found among the views of parents, since they were often not consulted in the past or do not have sufficient knowledge to make an informed decision. However, the status of their sons is not ambiguous—they are circumcised or they are not. What is interesting about the American situation is the continuing widespread practice of male circumcision despite the uncertainty of the medical community. It would appear that our prudence directs us to continue the practice until contraindicated; simply not being conclusively indicated does not provide a reason to end this practice. Other societies, guided by the British, Canadian, and Australian medical communities, have followed the opposite course: They do not routinely circumcise their baby boys given the uncertainty surrounding its necessity.

Male Circumcision: Explanation of the Procedure

The circumcision of males involves the partial or total removal of the foreskin, or prepuce, of the penis. The foreskin is a complex organ that covers the glans in the flaccid state. The outer layer of the foreskin resembles normal skin, whereas the inner layer is a mucous membrane—the entire structure could be considered analogous to the eyelid.

It should be noted that the foreskin is not an “extra flap of skin” as has often been considered but, rather, an “important platform for many nerves and nerve endings” (Taylor et al., 1996). Foreskin length varies with the individual. The circumcision procedure removes the foreskin and exposes the glans. After a few weeks, the glans surface changes from a moist surface similar to the inside of the eyelid or cheek to a more normal skin-like surface. When the penis becomes erect, the foreskin “unrolls” to reveal the
glans. The inner layer of the foreskin is exposed. Taylor et al. (1996) and most anti-circumcision groups insist that this inner layer is highly sensitive, erogenous tissue and that its removal diminishes the patient’s quality of life (i.e., enjoyment of sex). Pro-circumcision lobbies tend to ignore this question, and few studies have empirically considered this question.

Circumcision is performed by a variety of means. The techniques range from simply pulling the foreskin forward and cutting the excess with a knife to more technical techniques employing specialized clamps. Two basic steps must be taken during a circumcision: separation of the foreskin from the glans and amputation of the foreskin. At all times, care is taken to prevent injury to the glans, to not remove too much tissue, and to prevent excessive blood loss (American Academy of Pediatrics Task Force on Circumcision, 1999).

The specialists who perform circumcisions are most often pediatricians, obstetricians, and family practitioners. When circumcision is performed beyond the neonatal period, urologists are typically consulted as well (Holman, 1999). Physicians are trained in the procedure during their residency. A recent survey of residency programs found that 43% of pediatric residency programs taught circumcision compared to 95% of family practice programs and 84% of obstetric programs nationwide (Howard et al., 1998).

A Short History of Male Circumcision in the United States

As noted by historian David Gollaher (2000), routine male neonatal circumcision was almost unknown within the Gentile European community (including European settler states) prior to 1870. This all changed on February 10, 1870, when Dr. Lewis A. Sayre, a noted Manhattan orthopedic surgeon, circumcised a 5-year-old boy who was unable to walk. Sayre had noticed upon examination of the boy that his foreskin was severely constricted around the glans and was inflamed. Influenced by contemporary theories of reflex neuroses, where irritations at one location in the body could have far-reaching effects, Sayre guessed that the constricted foreskin was connected to the partial paralysis of the boy’s legs and decided to circumcise. The boy was cured, and Sayre became a powerful proponent of circumcision, publicly presenting his findings.

The burgeoning American medical community was ready to accept male circumcision as a solution to many problems. The concept of reflex neuroses was popular, and irritation of the glans was sure to cause problems elsewhere. It should be noted, as Gollaher (2000) pointed out, that female genitalia were not safe from the surgeon’s knife either. Clitoridectomy for treatment of hysteria was not unknown. Maines (1989) stated that “late-nineteenth physicians noted with alarm that from half to three-quarters of all women showed signs of hysterical affliction.” I believe, given the evidence of these two historians, that we can infer a general hysteria among the medical community concerning the genitalia of its patients (male and female) during this time period, and many types of solutions including electric shock, therapeutic massage, and surgery were being proposed to cure those patients. It is also important to remember that these treatments all cost money, and that the social class and power of the individuals purchasing such treatments will be important for their growing acceptance in American society. A nagging historical problem in this area is why female treatments for various problems died out whereas male circumcision became an almost universal practice among American males, and their doctors. Gollaher mentions a growing acceptance of Freudian sexuality and the limited number of women who were actually being operated on as possible reasons.

Sayre was not alone in his crusade, but he was a pioneer in medical circumcision. An important step in the spread of the practice was the 1891 publication of A History of Circumcision From the Earliest Times to the Present by Peter Remondino, a Californian physician and public health official. An excerpt from chapter 23, “Reflex Neuroses and the Prepuce,” illustrates the hysteria surrounding the foreskin and Sayre’s preeminence in the field. Although it is lengthy, I feel this excerpt is an important indicator of late-19th-century passions and worth including here. The excerpt is responding to the argument that practicing careful genital hygiene is as effective as circumcision in preventing pathologies of the penis, an argument we find in journals today:

The prepuce seems to exert a malign influence in the most distant and apparently unconnected manner; where, like some of the evil genii or sprites in the Arabian tales, it can reach from afar the object of its malignity, striking him down unawares in the most unaccountable manner; making him victim to all manner of ills, sufferings, and tribulations; unfitting him for marriage or the cares of business; making him miserable and an object of continual scolding and punish-
ment in childhood, through its worriment and nocturnal enuresis; later on beginning to affect him with all kinds of physical distortions and ailments, nocturnal pollutions, and other conditions calculated to weaken him physically, mentally, and morally; to land him, perchance, in the jail, or even in a lunatic asylum. Man’s whole life is subject to the capricious dispensations and whims of this Job’s-comforts-dispensing enemy of man.

In this regard, Louis A. Sayre was to medicine what Columbus was to geography. Neither Strabo nor Herodotus had anything to say regarding what existed beyond the pillars of Hercules, and neither Hippocrates nor Galen had anything in regard to this preputial Merlin, which in their day, even, had its existence. Neither Tissot nor Bienville, the two pioneers in the field of our knowledge regarding onanism and nymphomania, dream of the existence of this one cause of the diseases to which they gave so much time and study. It is only some twenty years since Louis A. Sayre read his paper entitled “Partial Paralysis from Reflex Irritation Caused by Congenital Phimosis and Adherent Prepuce,” before the American Medical Association. This was the starting-point from whence the profession entered into what had previously been a veritable “Darkest Africa.” (pp. 254-256)

Nothing short of circumcision will solve the problems outlined by Remondino. Sayre began a new movement in American medicine that was picked up by the public health community of which Remondino was a part. Remondino prescribed circumcision as a method to avoid some of the evils of life, not simply a cure for illnesses. The shift from curative to preventive medicine was under way, and doctors began to consider circumcision as a prophylactic procedure, necessary for a “clean” life.

From the public health perspective, circumcision promoted a cleaner, more hygienic state that would limit the spread of contagion through society. If the foreskin was absent, there would be no place for smegma to build up. Gollaher (2000) connected this sentiment to the urban sanitation movements of the 1880s. Dirt was a corrupt source of contagion, and many of the body’s secretions, especially smegma, were considered dirty. It was also pointed out by Remondino (1891) and others of the time that Jews were healthier than other groups, and the reason was that Jewish males are ritually circumcised 8 days after birth. Another benefit mentioned by Remondino was the cessation of masturbation, a true evil in Victorian society. From an article by Kistler titled “Rapid Bloodless Circumcision of Male and Female and Its Technique” in the May 28, 1910, issue of the Journal of the American Medical Association, the reasons for circumcisions are listed as follows:

1. Reduced tendency to convulsions in infancy arising from irritable nervous system.
2. Habit of masturbation not so likely to be formed.
3. Lessened irritability of child or adult.
4. Amorosity reduced.
5. A hygienic condition promoted.
6. Venereal diseases not so readily contracted, and consequently:
7. Fewer pelvic diseases in women.
8. For impotency in old men, as has been advocated.

Kistler (1910) also acknowledged that learning proper techniques of circumcision is critical for all physicians, since “many a surgeon has lost his best clients, and likewise many a good prospect has gone glimmering because of the unfortunate outcome of this little operation.” Doctors had a stake in this procedure, wished to promote its use, and realized that a public that did not traditionally practice circumcision would be skeptical at first. Thus, the spread of this procedure is connected not only with curing sickness and promoting public health but also with the power and influence that doctors have over their patients. Convincing men and parents to allow surgery when no pathology existed was no small task. The foreskin became an inherently pathologic appendage of the human body; the circumcised penis was the new physiologic norm. Anyone who was smart and listened to their doctor would accept this. Likewise, all parents should have their boys circumcised, since that is what doctors were doing for their own children, as physicians were quick to point out.

Gollaher (2000, p. 97) also connected the rise of circumcision with the general increase in operations. He pointed out that there were 200 hospitals in the United States in 1870 and more than 4,000 by 1910. These hospitals needed business. Moreover, new aseptic techniques developed by Lister made all surgical procedures safer.

As more and more of the middle class began using doctors and their new facilities, circumcision became
connected with childbirth. Doctors saw that older healthy male patients were unwilling to go under the knife in large numbers; however, infants were a different matter altogether. As Gollaher (2000) stated, “The ultimate popularity of circumcision depended not on convincing normal men to undergo the ordeal of surgery but on targeting a group of patients who could not object” (p. 100). Thus, the medicalization of childbirth included the circumcision of infants. Laumann et al. (1997) correlated the increasing incidence of circumcision with the increase in hospital births. Circumcision became a mark of the hospital and modernity, and by this mark the individual himself was modern.

The practice of routine male neonatal circumcision gathered momentum in the United States and spread to the other English-speaking countries of the world. In all cases, a common theme is present and has been pointed out by anti-circumcision groups: The practice was introduced to English-speaking, Gentile communities by the medical profession itself. The medical community then proceeded to make circumcision a standard procedure by passing the techniques along in the medical schools. The reasons for the procedure were not as important as its proper performance. Consider the following analysis of medical training styles in pediatric residency programs from 1998:

In most undergraduate and postgraduate training programs, one finds an implicit apprenticeship learning model (my mentor must be right), in which students observe what the teachers do and then emulate these clinical strategies with little scrutiny paid to the true value of the strategies. (Chessare, 1998)

Therefore, any change in opinions toward circumcision would have to be a self-reflective process for the medical community. When the medical community discusses circumcision today, a discussion of why it began the practice in the first place is noted by its absence. Furthermore, any move to abolish a practice becomes in effect a condemnation of physicians who are performing it and the doctors who passed the technique on.

By the mid 1960s, close to 90% of males born in United States were being circumcised at birth, an increase from 35% in 1932 and from almost nil in 1870 when Sayre performed his first operation. Between 60% and 70% of males continue to be circumcised today. The radical procedure begun by Sayre had become a routine medical procedure.


The final paragraph of the 1989 report of the American Academy of Pediatrics Task Force on Circumcision states,

Newborn circumcision has potential medical benefits and advantages as well as disadvantages and risks. When circumcision is being considered, the benefits and risks should be explained to the parents and informed consent obtained.

The task force is, in effect, pushing the responsibility of deciding to circumcise to the parents. It is necessary to pursue more history in order to understand the context in which this report was produced and why the task force is surprisingly unwilling to make any sort of normative statement.

Remondino’s book demonstrates that in 1891, some dissenting voices were arguing against medically indicated circumcision. Remondino wrote the book to quell that dissent. In the next century, Gollaher (2000) stated that “over the decades, as squabbles about ritual circumcision faded away, the ethical issue of doing surgery on healthy patients was virtually ignored. Voices urging restraint were few and faint” (p. 95). The silence ended with Gairdner’s 1949 publication of “The Fate of the Foreskin: A Study of Circumcision” in the British Medical Journal. In cash-strapped World War II Britain, a fledgling National Health Service was keen to work out the costs and benefits of all the procedures it would provide. Gairdner began his article,

It is a curious fact that one of the operations most commonly performed in this country is also accorded the least critical consideration. In order to decide whether a child’s foreskin should be ablated the normal anatomy and function of the structure at different ages should be understood; the danger of conserving the foreskin must then be weighed against the hazards of the operation, the mortality and after-effects of which must be known. Though tens of thousands of infants are circumcised each year in this country, nowhere
are these essential data assembled. The intention of this paper is to marshal the facts required by those concerned with deciding the fate of the child’s foreskin.

Gairdner’s article was a voice of prudence challenging a medical practice that was performed for what he considered dubious and unsubstantiated reasons. Probably the most important aspect of his article concerned phimosis, a condition in which the inner layer of the foreskin is pathologically adhering to the glans. Gairdner noted that at birth, the foreskin is attached to the glans and begins to separate over time. By 5 years old, most boys are able to retract their foreskins; some may take longer for full separation. In other words, diagnosis of phimosis before the age of 5 is an error, since the condition is completely physiologic. Despite this fact, circumcision of toddlers and newborns is still often prescribed in the United States owing to phimosis or its prevention. Furthermore, the forcible retraction of the foreskin for inspection of the glans of toddlers was causing iatrogenic conditions, since the practice of tearing apart tissues prematurely was damaging. In conclusion, Gairdner advised,

In the light of these facts a conservative attitude towards the prepuce is proposed, and a routine for its hygiene is suggested. If adopted this would eliminate the vast majority of the tens of thousands of circumcision operations performed annually in this country, along with their yearly toll of some 16 child deaths.

After the publication of this article, the British National Health Service decided not to provide coverage for routine circumcision. As a national body with power to enforce policy, the British National Health Service was able to consider the evidence and make a decision that directly affected clinical practice nationwide. At this point, the incidence of circumcision in the United Kingdom declined and was listed as 0.5% in 1972 (Wallerstein, 1980). The procedure became once again a solely religious practice in the United Kingdom. However, in the United States, where no central medical body existed to make such decisions, the practice continued unchallenged and was promoted by the American military for its soldiers as protection against venereal disease, a belief dating from the late 19th century (Gollaher, 2000, p. 118). In the United States circumcision became more common, while in the United Kingdom it disappeared.

It was not until the 1960s that the American medical journals began to publish articles critiquing routine neonatal circumcision. In 1965, Dr. William Morgan published “Rape of the Phallus” in the Journal of the American Medical Association. Morgan asked, “Why is the operation of circumcision practiced? One might as well attempt to explain the rites of voodoo! Ritual is seldom self-explanatory and still less frequently logical” (p. 123). In this somewhat tongue-in-cheek article, Morgan conjured up images of foreign women protecting their baby boys from American hospital staff possessing “an insatiable urge” to remove the foreskin. Although full of conjecture, the article employed commonsense thinking: The logic used to justify routine circumcision should also justify routine appendectomies, and many mothers who are used to their circumcised husbands will view an uncircumcised penis as less aesthetic. Morgan also oddly proposed the following: “[Circumcision] is the one way an intensely matriarchal society can permanently influence the physical characteristics of its males.” In the end, Morgan concluded that there is no valid indication for circumcision other than religion. If nothing else, Morgan’s article caused a stir.

In the New England Journal of Medicine, Bolande (1969) compared circumcision and tonsillectomy as two “ritualistic surgeries, widely performed on a nonscientific basis” (p. 591). Bolande did not go so far as to call for a stop to the practice (and some correspondence to the article criticized him for this). However, he did point out that circumcision is a uniquely American practice and that the reasons given for the procedure are unsubstantiated. The following year, Preston (1970) published a widely cited article titled “Whither the Foreskin? A Consideration of Routine Neonatal Circumcision” that called the practice into question:

It is interesting to note that all of the reasons advanced for routine circumcision have to do with the prevention of certain conditions, not with the establishment of a condition such as strong teeth and bones or a normal cardiac reserve. (p. 1853)

Preston then analyzed the evidence for the reasons given to indicate routine circumcision: cancer of the cervix in women with unaltered partners, cancer of the
penis, phimosis, venereal disease, balanitis, masturbation, and social acceptance in the locker room. In each case, the evidence was controversial, the actual risks of penile illness involved were miniscule (as in penile cancer), or, as in the case of phimosis, a misinterpretation of penile physiology existed. Preston concluded the article with the statement, “Circumcision of the newborn is a procedure that should no longer be considered routine.”

U.S. national medical organizations were not unaware of these articles and past events in the United Kingdom. In 1971, after reviewing the available evidence, the American Academy of Pediatrics Committee on the Fetus and Newborn stated that “there are no valid medical indications for circumcision in the neonatal period” (p. 110). With this pronouncement, the public debate over circumcision had begun. The position of the American Academy of Pediatrics was repeated in 1975 and again in 1983, and no reasons had come forward to change its opinion. However, unlike the British National Health Service, the policy statements of American medical societies are in effect only suggestions.

It was also during this time period, in 1980, that Edward Wallerstein published *Circumcision: An American Health Fallacy*. Wallerstein attempted to present the contradictions in the medical literature concerning the reasons for circumcision. He concluded the book by classifying circumcision in the United States as “a solution in search of a problem” (p. 197).

The incidence of male circumcision was only somewhat affected by the new policies and publications. In the period between 1974 and 1984, the incidence of routine circumcision dropped from 86% to 71% but was still the highest compared to other countries in which circumcision was not ritually performed (Wiswell, 1990). In an effort to find the reason for this high incidence, two studies in 1982 and 1983 examined the effects of the provision of information to pregnant mothers. In each study, the incidence of circumcision was more than 90%. Whether or not the mothers had received information about circumcision made no statistical difference in their decisions. The 1983 study stated that

we are reluctant to assume the role of active advocacy (one way or the other) because our experience suggests that the decision is not usually a medical one. Rather, it is based on the parent’s perceptions of hygiene, their lack of understanding of the surgical risks, or their desire to conform to the pattern established by the infant’s father and their own societal structure. (Maisels et al., 1983, p. 453)

This study, whether the authors intended to or not, represents an enormous shift both in the rhetoric deployed to support circumcision and in the relationship between doctors and parents considering the procedure. Were the authors implying that routine male neonatal circumcision is an irrational American cultural practice? If so, it goes against everything that Sayre, Remondino, and their peers were arguing for in the late 19th century. They were promoting circumcision as a rational, scientifically indicated medical procedure that reasonable, educated parents would choose for their sons.

In both studies of the parents’ choices, the ethical propriety of performing a procedure that is not medically indicated is never discussed, although the policy of the American Academy of Pediatrics at that time was that such procedures should not be performed. In the case of circumcision, parental wishes have become sufficient while medical necessity, normally a guiding rule for the surgeon’s knife, takes a back seat.

Apparently, despite the publicly stated policy of the American Academy of Pediatrics (as well as the American College of Obstetrics and Gynecology and the American Academy of Family Physicians) that circumcision was not indicated, pediatricians continue to perform the surgery. There are two options that will help us explain this paradox: first, that the pediatricians are acting on the parents’ wishes despite the new policies, and second, that the pediatricians simply do not agree with the new policies and rely on the proven experiences of their own clinical practices. The first option is almost ridiculous, since the idea of doctors performing surgeries on minors that they do not agree with nor feel are indicated is an impossibility and could constitute malpractice. But as outlandish as this option may seem, Maisels et al. (1983) considered it a strong possibility because parents are apparently not considering medical necessity when opting to circumcise their boys. If this is so, the physicians do not seem to realize these reasons, or never asked. Therefore, the second option appears more plausible: most American pediatricians still felt that circumcision was a sound decision that bestowed upon the individual a superior physiological state and that parents agreed. This was the received wisdom of the trade.
Everything changed again in 1985 when Dr. Thomas Wiswell published his report titled “Decreased Incidence of Urinary Tract Infections in Circumcised Male Infants.” Here was the problem that circumcision needed. The study found that urinary tract infections (UTIs) were 10 times as common in uncircumcised boys. Subsequently, studies were published from other institutions that corroborated this finding. A particularly heated exchange in the Letters to the Editor of the January 1990 issue of *Pediatrics* that responded to Wiswell and Geschke’s June 1989 article titled “Risks From Circumcision During the First Month of Life Compared With Those for Uncircumcised Boys” is demonstrative of the debate concerning the procedure. Wiswell and Geschke concluded that “neonatal circumcision [is] beneficial in reducing the incidence of urinary tract infection and associated bacteremia” and that “short-term complications of routine circumcision are rare and mostly minor” (p. 1011). Those responding called the findings into question. The major complaints were that (a) a case record analysis of urinary tract infections may have missed many infants who were treated as outpatients and not admitted, (b) the study was not a “cohort-based” study with control groups, (c) the reasons that circumcision was not performed could have predisposed the baby boy to UTI (e.g., premature birth), and (d) most of these studies had a number of confounding variables present that were not accounted for. A short article published in *Lancet* also questioned the connection between UTI and circumcision by suggesting that modern medical intervention in the entire birth process exposes the infant to nonmaternal bacteria strains. With regard to increased UTI incidence, the authors postulated that

if [the UTI studies] are correct, this will be the first known instance of a common potentially lethal disease being preventable by extirpation of a piece of normal tissue. To reconcile this phenomena with existing views of evolution and biology, it is suggested that the affects of one unphysiological intervention are counterbalancing those of another—ie, colonization of the baby’s gastrointestinal tract and genitals in maternity units by *Escherichia coli* strains of non-maternal origin, to which the baby has no passive immunity. (Winberg et al., 1989)

Whatever the complaints raised against the studies connecting urinary tract infections to unaltered boys, the American Academy of Pediatrics still felt compelled to reevaluate its policy. The review panel produced the August 1989 report cited at the beginning of this section. In policy language, the fact that the American Academy of Pediatrics admitted that neonatal circumcision had “potential benefits and advantages” was a dramatic change from its previous statements beginning in 1971. In the increasingly litigious society of the late 1980s and early 1990s, not performing procedures that could possibly benefit the patient had definite consequences that could result in malpractice suits. Some possible benefits given for circumcision were prevention of penile cancers and decreased UTI rates among newborn boys. The new policy also gave pro-circumcision advocates fuel for their rhetoric. Conversely, performing a surgery without medical cause is also malpractice; thus, the American Academy of Pediatrics’ policy freed doctors to choose either path with support.

The policy shift resulted in a new wave of controversy in the *American Family Physician*, *Pediatrics*, and the *New England Journal of Medicine*. In March 1990, Wiswell published “Routine Neonatal Circumcision: A Reappraisal” in the *American Family Physician*. Wiswell was gladdened by the shift toward not opposing the practice. The article was presented along with two editorials by Martin Altschul and Robert Dozer that spoke against routine circumcision. Later that year, in December, four letters to the editor and Wiswell’s reply appeared. All of the articles and letters are impassioned pleas for their case. Wiswell viewed UTI in newborn males as a dangerous disease that is almost completely preventable by a quick surgical intervention. Altschul admitted to the increased rates of UTI in unaltered males but saw the overall incidence of UTI as so low that, by his math, $60,000 worth of routine circumcisions are performed to prevent each case of UTI. Dozer insisted that circumcision is a secularized religious practice.

In the response letters, both sides of the argument are present. David Lay (1990, p. 1522), a family physician, indicated that he supports routine neonatal circumcision because unlike pediatricians, he sees the complications among uncircumcised adult male patients that pediatricians do not. In effect, he accused anti-circumcision pediatricians of not being able to “think outside the box” and consider the problems of adulthood. Another strong letter in support of Wiswell
was written by Edgar J. Schoen, chairman of the 1989 American Academy of Pediatrics Task Force on Circumcision. Schoen influenced the task force to view routine circumcision in a more positive light. In fact, the 1989 policy was not strong enough for Schoen, since it did not fully recommend the procedure. Schoen’s views were expressed more completely in an article he published in the May 3, 1990, issue of the New England Journal of Medicine. His article was placed alongside that of Ronald L. Poland, a physician at The Pennsylvania State University College of Medicine who is against routine circumcision as a medically indicated practice.

Schoen (1990) matched the logic and use of evidence employed by Wiswell. Their reasons for supporting neonatal circumcision are characterized by the following excerpt from Wiswell (1990):

Several issues have convinced me of the benefits of neonatal circumcision:
(1) the prevention of urinary tract infections and their sequelae;
(2) the prevention of penile cancer;
(3) the prevention of sexually transmitted diseases;
(4) the low risks of complications from the procedure;
(5) the lower incidence of penile problems among circumcised boys;
(6) the recent evidence that circumcision protects against HIV infection;
(7) the cost-benefit from performing the procedure during the neonatal period rather than in childhood or adulthood; and
(8) the lack of evidence for the hypothesis that “optimal” penile hygiene prevents the adverse sequelae of noncircumcision. (p. 859)

Interestingly enough, there are some points of agreement between this list and the list from 1910 presented earlier. However, Schoen’s article adds cancer of the cervix to the list, and there is more agreement between the pro-circumcision arguments of 1910 and those of 1990. If fact, both sides of the circumcision debate have themes that have not changed since the 1880s, such as the notion that proper penile hygiene provides the same benefit to the individual that circumcision does. Despite more than a century of medical practice, the debate surrounding male circumcision remains fundamentally the same, supported and opposed by the same arguments: circumcision promotes health versus circumcision is not necessary for health and detracts from quality of life. This alone would suggest that the key issues in the debate are not related to medical science but to social perceptions of medical practices. The decision to circumcise is not based on experiments and statistics—the decision is based on assumed traditions and the relationship between physicians and parents, a relationship that appears to be suffering from a severe breakdown in communication.

I have also found that the fourth reason as presented by Wiswell (1990) is a bit illogical. Surgical procedures are not done because they have a low risk of complication; this is not, as Wiswell states, “a benefit of circumcision.” This argument strategy runs throughout the pro-circumcision arguments, typically stated thus: “The benefits of routine circumcision of newborns as a preventative health measure far exceed the risks of the procedure” (Schoen, 1990). A proper comparison would be of the long-term effects of circumcision versus the effects of remaining unaltered. Unfortunately, we find few studies, if any, that follow this design. The studied effects of circumcision are the absence of uncommon diseases. Other long-term effects of the procedure are rarely, if ever, studied. I found no major work that searches for such effects, only anecdotal remarks.

Further analysis of the responses to the 1989 policy concerns the anti-circumcision authors, Poland and Dozor. Each author concluded that parents make the decision to circumcise their sons for nonmedical reasons. Dozor called it a secularized religious practice. This argument betrays a misunderstanding of history. There is no evidence to suggest any connection between Jewish and Moslem religious practices and routine medical circumcision in the United States. On the contrary, Sayre and his contemporaries believed solely in the medical efficacy of the procedure. The American medical community fought an uphill battle to build widespread acceptance for routine circumcision among its patients. The medical community believed in the procedure and its benefits. Therefore, Poland, who argued that the question is not completely medical, and Dozor, who argued that the medical community promotes a crypto-religious practice, are both wrong.

If parents in the 1990s are not questioning the medical community about circumcision, it is because they have learned to trust the authority of the physician. Their parents trusted that authority, and many of their grandparents did as well. This is how the circumcision rate went from relatively nonexistent to nearly 90% in one century. The continuing decision to circumcise...
made by modern parents does not then indicate that male circumcision has somehow left medicine and entered the cultural sphere; on the contrary, it indicates the general acceptance of medical authority and routine. The fact that so many doctors have “wrung their hands” of the debate and left the issue up to the parents represents the acceptance by those physicians of a different role in society, one that is subservient to culture. However, if a baby boy is taken away to be circumcised with little or no discussion between physician and parent, then the parents have accepted the physician’s authority. They have, in the least, accepted some past physician’s authority, for the father will typically be circumcised, and this is a common reason provided for choosing to circumcise. The physician has not accepted the parents’ culture. Consider the following excerpt from a 1990 study of the reason parents choose to circumcise:

Families of healthy infants should receive adequate education regarding circumcision and support for their decisions. We question the wisdom of actively discouraging parents who seem in favor of circumcision or even those who seem ambivalent. On the other hand, maintaining neutrality while presenting medically unsophisticated parents with circumcision data that continues to confuse physicians also seems unhelpful. (Larson & Williams, 1990, p. 808)

Here, doctors are portrayed less as medical advisers and more as sources of unfiltered, controversial medical information that wait for “unsophisticated” parents to give them orders. If the doctors have accepted a new role, the patients are not aware of it.

I will now leave the 1989 policy statement and take a look at the new policy, written in 1999. The issues raised here will continue to be relevant as we reach the present.

**1999: A Return to the 1970s?**

Beginning with the articles mentioned above, a storm erupted around circumcision in the 1990s. Lay anti-circumcision groups such as the National Organization of Circumcision Information Resource Centers, the National Organization to Halt the Abuse and Routine Mutilation of Males, and Doctors Opposing Circumcision gained power and presence, especially on the Internet. The noise made by these groups, the international recognition of female circumcision, the continuing publication of conflicting studies throughout the 1990s, and the pronouncements against routine circumcision made by foreign organizations of pediatricians in Canada, the United Kingdom, and Australia sent the American Academy of Pediatrics Task Force on Circumcision back to the drawing board. This time, the task force extensively researched the English-language medical literature back to 1960 to review what was known and reported that 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. (1999, p. 686)

Both sides of the debate were looking for a bit more than this. It should be noted as well that the Council of Scientific Affairs of the American Medical Association reviewed the literature concerning routine male circumcision and produced similar findings.

To its benefit, the task force did point out what few had previously: Circumcision does greatly reduce the incidence of UTI and penile cancer, but the absolute incidence of both these diseases is so rare that circumcising routinely to prevent so few cases cannot be recommended. Schoen and Wiswell were furious and joined forces with Stephen Moses to publish a polemic in *Pediatrics* in March 2000. One can see how emotional both sides can become in this argument:

Further, by referring to circumcision as “not essential to the child’s current well-being,” the Task Force seems to be arguing against other pre-
ventative health measures, such as routine immunization, preventive dental care, and nutrition aimed at future health, none of which are essential to the current well-being.

Schoen et al. also criticized the task force of interdisciplinary imbalance, being mostly pediatricians and not able to view the procedure from a lifelong view. They felt that circumcision was a necessity for lifelong health and was best performed during the newborn period. They felt that circumcision should be routine. Schoen has repeatedly compared circumcision to a vaccine.

These criticisms of the overall rationale of the policy are harsh and not completely unfounded. Some individuals may feel that a 1:100,000 risk of penile cancer and a 1% chance of UTI in the first year of life is enough of a risk to choose circumcision. But the recurring problem with risk assessment and circumcision is that individuals are not making these decisions for themselves; rather, parents are making proxy decisions for their sons. No one can know how these boys would have evaluated the data.

The 1999 policy statement is far more comprehensive than the 1989 statement. Many are pleased to see that the task force recommends procedural analgesia. This removes some of the paradoxical stance toward the circumcision procedure versus other surgeries, in which analgesia is always used. The task force also broached the subject of the sexual experience and circumcision status. A few recent studies, both anatomical and social, show that the foreskin is much more than simply a flap of skin. The future quality of life for an individual is a consideration in the circumcision decision. Some men, given the chance, may have opted to remain unaltered, deciding that the dynamics of sexual experience outweigh the low risk of disease.

**Informed Consent and Neonatal Surgery**

The new policy is not without problems, however, and these are generally contradictions between statements concerning male circumcision and more general ethical statements made elsewhere by the American Academy of Pediatrics. By allowing the parents to take the responsibility for the circumcision decision, the academy has challenged other policies concerning informed consent. The practice of obtaining consent by proxy for the treatment of infants and children is well accepted in the American community. However, providers have legal and ethical duties to their child patients to render competent medical care based on what the patient needs, not what someone else expresses. Although impasses regarding the interests of minors and the expressed wishes of their parents are rare, the pediatrician’s responsibilities to his or her patient exist independent of parental desires or proxy consent.

It would appear that the American Academy of Pediatrics Committee on Bioethics is acknowledging the rights of the parents to raise their children, but within bounds. Medical experts have some power to provide appropriate treatment against the parents’ wishes when necessary. This reasoning also extends to the refusal to perform certain procedures that parents ask for. It must be asked upon what criteria are physicians making their choices versus the parents? The policy on circumcision clearly states that we need to respect cultural and traditional values. But, as I have argued, medical circumcision in the United States is not a cultural decision, it is a medical decision; therefore, medical considerations should come first. If that is the case, then it follows that the Committee on Bioethics’ policy outweighs the parents’ wishes. Critically, I should note here that the American Academy of Pediatrics has never asked its Committee on Bioethics to consider male circumcision (Gollaher, 2000, p. 200).

We are now at the stage in the argument when comparison to other societies will prove beneficial. I would also like to bring the topic of female circumcision into the discussion. Here, I hope to show that while the United States is the least critical of male circumcision, it has joined other societies in taking a strong stance against female circumcision.

**Circumcision on the International Scene**

As previously stated, Canada, the United Kingdom, and Australia all imported the practice of routine male circumcision from the United States. However, the incidence of the procedure never reached the levels it did here. Since World War II, the practice has almost ceased in the United Kingdom, Australia has about 10% of its males circumcised, and Canada has between 3% and 6%. Various pediatric associations in these three nations have spoken sharply against the practice. The Canadian Pediatric Society Fetus and
New Born Committee (1996) followed the American Academy of Pediatrics’ position closely, indicating that circumcision could be recommended but that parents may opt for the procedure for cultural reasons. This position has not changed since 1982. The Australian College of Pediatricians decided that it could not be dogmatic about the procedure but noted that in the majority of cases, medical reasons will not be a primary motivating factor in parents’ decisions. The college did admit that there may be a legal issue involved, in that the procedure may violate human rights, but the courts have not made a determination.

In stark contrast to this rather conservative position, the Australasian Association of Paediatric Surgeons (1996) is absolutely opposed to routine male circumcision, calling it “inappropriate and unnecessary.” Likewise, neither the U.K. General Medical Council nor the British Medical Association supports routine circumcision. Each also makes a point to physicians that they may refuse to perform the procedure if requested. It should be noted that in the United Kingdom, almost all circumcisions performed are done for religious or medically indicated reasons and that the rate of newborn male circumcision is less than 1%.

In the English-speaking world, there is some consensus concerning male circumcision, even if establishing reasons for its continuing popularity in the United States is a challenge. Possibly because the practice began here or because we have no official national health service to dictate policy, the routine circumcision of males as a “system” gained momentum over time. The procedure came to be compared with cutting the umbilical cord, a normal step in a boy’s birth. As physicians were trained in the practice, they went on to train their apprentices. Also, most male physicians are circumcised themselves, thus reinforcing the feeling that circumcision is a normal, routine practice and that a circumcised penis is itself “normal.” Not being circumcised was abnormal and uncommon, nearly but not quite pathologic. These traditions internal to the medical community are some possible reasons for Gentile American circumcision.

**Female Versus Male Circumcision: What Is the Difference?**

Initially, I feel compelled to qualify the following section. “Female circumcision” represents a spectrum of practices from ritually pricking the labia to shed a drop of blood, to full infibulation, an appalling mutilation of a woman’s genitalia. Therefore, it is difficult to group these practices under one name, although Western media, opinion, and policy have not typically differentiated between them. In this section, I will deliberately avoid discussing these practices in particular while trying to emphasize the inherent problems involved in using different language to discuss male and female circumcision.

Just last year, in 1999, with the new policy of the American Academy of Pediatrics, all the major pediatric associations in the English-speaking countries came to agreement that they could at least no longer strongly recommend routine male circumcision (Gollaher, 2000), although most allow the practice for cultural reasons and in no case is it completely illegal. However, in the opening paragraph of the British Medical Association’s (1996) “Guidance for Doctors” concerning male circumcision is the following sentence: “The subject should not be confused with female ‘circumcision’ which was outlawed by the 1985 Prohibition of Female Circumcision Act.”

To most observers in the United States, female circumcision is a whole different story when compared to male circumcision. This is made clear by Schoen (1995):

> The problem with describing female genital mutilations as female circumcision is that the latter can be confused with the circumcision of newborn boys, a low-risk procedure with medical benefits.

Therefore, excision of healthy flesh from a healthy child is acceptable if scientific studies say it is so, not if the choice is made for cultural reasons and the patient is female. This statement, however, is contradicted by Schoen’s many other statements in which he claims that the final choice for male circumcision is the parents’, and often for nonmedical reasons, which would seem to describe the practice of female circumcision as well.

The American Academy of Pediatrics Committee on Bioethics (1998) made the following determination in 1998 concerning female circumcision:

The American Academy of Pediatrics:
1. Opposes all forms of female genital mutilation (FGM)
2. Recommends that its members actively seek to dissuade families from carrying out FGM
3. Recommends that its members provide patients and their parents with compassionate education
about the physical harms and psychological risks of FGM.

4. Recommends that its members decline to perform any medically unnecessary procedure that alters the genitalia of female infants, girls, and adolescents.

Compare the fourth recommendation with the following excerpt from the 1999 American Academy of Pediatrics Task Force on Circumcision, part of which I repeat for emphasis:

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. (p. 686)

The Committee on Bioethics is quite clear on its ban of medically unnecessary procedures for female minors, but not so for males, who are absent from the discussion completely. Also, it is quite clear that a woman who has reached 18 years of age may do as she pleases, since she is able to legally consent. Males do not have the same luxury or the chance to decide for themselves, according to the Task Force on Circumcision. Possibly more important, the Committee on Bioethics provides physicians with the ability to refuse parents’ wishes concerning their daughters; conversely, the Task Force on Circumcision states, “Parents should not be coerced by medical professionals.”

Is this really a case of apples and oranges? Or are we applying a double standard to practices of altering the genitalia? The foreskin is erogenous tissue, and its loss at birth has unknown effects on a man’s future sexual experience. Fortunately for most American men, they will never know the difference. This fact alone has probably affected the entrance of the loss of sexual sensitivity into the discourse surrounding male circumcision. There are no studies available that are conclusive, and any study done would be extremely subjective.9 We will not find volunteers to undertake before-and-after studies. Thus, this question, while often brought up by the anti-circumcision groups, is unfortunately difficult to answer. Given that we may never know the answer, some other forms of evidence may be useful. One hundred years ago, the foreskin was removed to halt masturbation, and nymphomania in males could be cured by circumcision.10 That the foreskin was connected to sex was common knowledge in late Victorian society. This fact may help us consider circumcision today.

There is also the question of age. In America, most men do not remember their circumcision day, but adolescent women from Africa do. The effect of firsthand testimonials by supermodels on television of being held down in a foreign village to be cut in unsanitary conditions is horrific. But why then do we not consider the image of a helpless infant being taken from parents who freely offer him, strapped down to a table, and circumcised without anesthesia equally horrific? Yet, this procedure was standard for nearly a century in the United States. Clearly, the cultural situation surrounding circumcision is the important determinant of its impropriety, and it is always easy to condemn the foreign.

Reports of female and male circumcision in Arabia were first popularized in the West by Sir Richard Burton in A Personal Narrative of a Pilgrimage to Al-Medinah & Meccah (1854). Burton was notorious for supposedly having himself circumcised as a necessary part of his conversion to Islam (Rice, 1990). These reports were received with indignation; such activities were only dimly known to European Christian and were always the practices of semibarbarous foreigners or European Jews, who were outside of mainstream society. However, the reports of Western doctors circumcising boys in New York City in the 1870s were only mildly opposed. This was a product of European culture and science.

**Conclusion**

The questions ending the last section are why this project was done. To reiterate an initial point: I am not attacking the American medical profession. Sayre and his peers were offering solutions for a society they saw fraught with problems and being invaded by immigrants. The need for sanitation was great. Circumcision was a means to an end.

This problem of contemporary circumcision ultimately reduces to a question of evidence. When the medical profession of the late 19th century introduced circumcision to the public as a new procedure, what constituted supporting evidence was far different from what we need today. There were no population-based longitudinal studies performed to prove that circumcision was the cure for a host of ailments. Circumcision appeared to be a cure because Sayre made a boy walk again and because the Jews of North America appeared to be a healthier minority, and all Jewish men
are circumcised. Given the same criteria today, we would never introduce routine circumcision.

Currently, the medical world is a far different arena than it was 130 years ago. Sayre deduced that circumcision would work as a panacea; today, the same cure must be proven by inductive logic. However, we do circumcise the majority of our boys while large national-level medical organizations all over the world continue to review the medical literature and find that, according to today’s standards, there is no reason for male circumcision. The paradox is clarified by recognizing that the evidence does not show that the procedure is particularly harmful either. The medical community cannot inductively show that it should cease circumcising male neonates. This is the position we are in today. One would think that in light of such confusion, the procedure would be brought to a halt until we knew for certain according to contemporary standards of evidence how circumcision affects us. This is not occurring. Why?

The answer to this question, I believe, lies in the aura of professional credibility. As stated above, most doctors are taught according to an apprentice model. The profession has a tradition that it follows. For a physician to cease performing circumcisions is far more than a change of clinical practice in light of new evidence. All the reviews of literature performed by medical organizations in many countries, including our own, concerning routine male circumcision show that there was never sufficient cause, according to contemporary standards, to routinely amputate the foreskins of baby boys. For a physician to cease performing circumcisions now represents a condemnation of past practices and an admittance of error. The error is most serious because it is committed upon the genitalia. The decline in tonsillectomies in recent decades is a famous example of changes in medical opinion, but the foreskin is somewhat different, more hidden and taboo. Furthermore, the tonsils were removed in an overactive response to a pathological condition; circumcision is purely preventative and a response to possible future pathologies.

To call into question the received knowledge of the medical profession, passed from doctor to resident, is a revolution of sorts, for progress typically means new and better procedures to replace the old, not the cessation of a common practice. I believe this is why we see such tentative statements coming from the American Academy of Pediatrics. By purposely avoiding its own Committee on Bioethics, the American Academy of Pediatrics Task Force on Circumcision was able to equivocate the issue before our eyes. What the task force is saying in effect is, “As scientific doctors, we find ourselves unable to recommend or deny this procedure; therefore, you will decide and we shall be your scalpels. This is no longer a medical question.” In one dramatic sweep, the task force decided not to make a decision and absolved itself of all guilt while continuing to perform a questionable procedure. There is no other medical procedure performed on minors, male or female, that follows this policy or has this history. But in the United States in the year 2001, this is the policy we have for neonatal male circumcision.

Maybe I am unfair in my assessment. It is entirely possible that the only way to make sense of the numerous unsolved paradoxes above is to concede that circumcision is an important rite of passage in Gentile American culture. If this is so, it is a silent ritual, uncelebrated and unacknowledged by all who participate. I am unaware of any symbolism surrounding medical circumcision besides that of the sterile room, the masked doctors, and the stainless steel instruments. This is the culture of medical science.

Notes

1. Finding clear, uncontested statistics is difficult. The National Center for Health Statistics reports 62.8% incidence nationwide in 1997. However, regional differences are seen (39% in the West compared to 81.6% in the Midwest), and a recent survey of residency programs (Howard et al., 1998) showed consistently higher rates. Studies done in the early 1980s reported circumcision rates near 100% at individual hospitals (Herrera et al., 1982; Maisels et al., 1983).

2. Obviously, Lancet is a British journal. However, many articles on circumcision can be found, as well as many contributors to U.S. journals. It should be noted that the incidence of the procedure in the United Kingdom is far less than that in the United States.

3. A fitting term for this discussion, since many consider penile pathologies warranting circumcision to be iatrogenic.

4. Some suggest that circumcision may be reversed by a variety of techniques and that reversal procedures have been performed since antiquity. This practice is not widespread, and it is unclear as to whether it constitutes a true reversal of neonatal circumcision or a new physiological state (see Bigelow, 1992).

5. Taylor et al. (1996) published a landmark article that presents the first careful study of foreskin anatomy at macroscopic and microscopic levels.

6. Examples are the Mogen clamp, the Gomco clamp, and Plastibell devices.

7. See Laumann et al. (1997). It can be assumed that only Jews and Moslems were practicing circumcision in 1870, neither of which constituted a significant portion of the population at that time.
8. I am heavily indebted to my colleague, Wairimu Njambi, who has recently defended her dissertation on female circumcision. Our frequent discussions contributed greatly to my understanding of these issues.

9. I should also add that no modern studies have been performed to determine possible benefits of female circumcision. This is not an attempt to be insensitive on my part but, rather, to point out discrepancies in scientific evidence used for policy statements.

10. Many examples of this can be found in Remondino (1891).

References


Herrera. (1982).


Lawrence S. Dritsas is a graduate student in the Science, Technology, and Society Program at Virginia Polytechnic Institute and State University.