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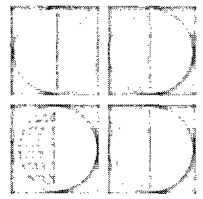


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A Biocultural Analysis of Circumcision



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ABSTRACT: The phenomenon of circumcision may well serve a range of religious and symbolic functions. In addition to these conceptual categories, we argue that circumcision also serves a more mundane, practical function of lowering excitability and distractibility quotients—sexual arousal—of pubescent males, i.e., biasing young males more toward increased tractability which would enhance group efforts and less toward individual goals of amorous exchanges. Neurological data suggest that early lesions of the prepuce/foreskin tissues would generate a re-organization/atrophy of the brain circuitry. This re-organization/atrophy, in turn, is suggested to lower sexual excitability. Epithelial data indicate that keratinization of the more exposed glans penis would lower the sensibility, hence sexual excitability, of the circumcised male's genitalia. In addition, circumcision removes the foreskin-prepuce which, by secreting smegma, would also minimize any pheromonic qualities which the smegma may generate. Inferential data support the hypothesis that a practical consequence of circumcision, complementary to any religious-symbolic function, is to make a circumcised male less sexually excitable and distractible, and, hence, more amenable to his group's authority figures.

The biocultural character of the human condition has recently received analytical attention (Barkow, 1980, 1989; Barkow, Cosmides, and Tooby, 1995; Durham, 1979, 1990; Richerson and Boyd, 1988; Wright, 1994). The polarizing dichotomy of nature *versus* nurture positions has been gradually replaced by an interactive paradigm wherein (1) over generations, the cultural "rules" of a society are aligned with biological biases and (2) over an individual's lifetime the person's "genes" help to sculpt a micro-ecology for the person in which he or she is comfortable/pre-adapted (Rowe, 1994; Scarr and McCartney, 1983). This article attempts to integrate one behavioral set—circumcision—both within cultural matrices and within humans' biological heritage.

The goal here is to integrate three major points. First, any culture-wide incorporation of a behavioral set into the day-to-day lives of a community's citizens is

not random, but filtered over time for net gains for the community. Second, the human's penis has a unique character and origin. Third, the act of circumcising the penis represents a net gain for any commonweal which systematically practices circumcision, and, thereby, the act has become embedded within the culture's overall matrix.

NON-RANDOM CULTURAL RITUALS

Although any one culture undoubtedly has idiosyncratic factors, it is also arguable that behavioral themes will undergird the various cultures around the world (see Harris, 1974, 1979, for examples and theoretical discussion). For example, for any intact social and political group, i.e., a tribe, to survive across generations, that group must solve important problems: (a) potable water must be secured and maintained; (b) nutrients, especially proteins, must be reliably provided; (c) births (at

least 2,100 births per 1,000 women) and socialization of children must occur; (d) marauding young men from competing tribes must be prevented from successfully attacking the group; and (e) energetic young men *within* the group need to have their energy maximally guided into constructive behaviors which benefit the group and need to have that energy minimally allowed to be disruptive.

To the extent that a/any group can fulfill these necessary, if not sufficient, preconditions, then the more viable that group can become in inter-cultural competition. The *World Ethnographic Sample* (Murdock, 1957) and the *Ethnographic Atlas* (Murdock, 1967) contain numerous examples of extinct groups which were either eradicated or were absorbed into larger groups. This paper argues that circumcision can add a ply of competitiveness to a culture.

CIRCUMCISION: CULTURAL RITUALS

"Circumcision" involves the permanent removal of the prepuce or foreskin of the male, invariably a young male who is often an infant. A number of diverse cultures have included circumcision in their ritual and religious worlds: Judaism, Islam, tribes in sub-Saharan Africa, tribes of Australian aborigines. Each group has an elaborate set of images, metaphors, symbols, and rationales for the act itself: removal of the foreskin or prepuce (see Pierce, 1964, for a Moslem example, Turnbull, 1962, for a sub-Saharan African example, and Tonkinson, 1978, for an Australian aboriginal example, and see Caldwell and Caldwell, 1996, for a map of the distribution of levels of circumcision in contemporary sub-Saharan Africa).

The written history of Jewish circumcision is both long and rich and well

illustrates the ornate cultural context which surrounds the physical procedure itself. "Circumcision from the Jewish Perspective" in the *Encyclopaedia Judaica* (1972, p. 568–576) gives the following perspective on Jewish circumcision. Jewish circumcision originated, according to the biblical account, from a divine behest. From Genesis 17:11–12 comes the prescription: "Every male among you shall be circumcised. And ye shall be circumcised in the flesh of our foreskin, and it shall be a token of a covenant betwixt Me and you. And he that is eight days old shall be circumcised among you, every male throughout your generations." The covenant involved a promise that Abraham's lineage would be multitudinous and that these multitudes would inherit the land of Canaan if Abraham and his descendants would practice circumcision. Abraham circumcised himself, at the age of 99, his son Ishmael, all the males of his household and his slaves. In the following year when Isaac was born, he, Isaac, was circumcised on the eighth day. Circumcision was considered so important that the rabbis taught that were it not for the blood of the covenant (circumcision), heaven and earth would not exist. The ritual of circumcision was and is viewed as a sign of faith. Any perceived medical overlay of the practice was to have occurred only recently.

Complementing any religious-symbolic function, the behavioral question would remain: "What attributes of the human foreskin would be affected by its being removed?"

THE HUMAN FORESKIN

Compared to chimpanzees and gorillas (and the orangutan), the human foreskin and penis is unique in four respects.

(1) The human foreskin is hairless.

(2) The human foreskin is attached at the front (fore-) of the penis rather than at the base (aft-) of the penis.

(3) The human penis has a comparatively increased diameter.

In terms of diameter, there is a good deal of individual difference, but a reasonable average for men is approximately 1.5 inches in diameter for an erect penis (WHO, 1991; Rushton and Bogaert, 1987). The average for man's nearest primate relative, the chimpanzee (*Pan troglodyte*), was 1.2 inches at the base with a slow tapering toward the tip (Dixson and Mundy, 1994). In fact, there appears to be minimal overlap between the diameter of the human flaccid penis and diameter of the erect chimpanzee penis. This minimal overlap of width is contrasted with a good deal of overlap in the length of the erect penis wherein a sample of chimpanzees averaged 5.7 inches (sd = 0.8 inches) versus 6.2 inches for men. A sample of chimpanzees from Yerkes laboratory (Yerkes and Elder, 1936) averaged 6.9 inches for the erect penis. This average actually exceeds the average for men (at 6.2 inches). As measured by Izor et al. (1981), the length of the pars libera of a bonobo chimpanzee (*Pan paniscus*) was 1.7 inches. Diamond (1992) estimates the length of the gorilla's penis at 1.25 inches and that of the orangutan at 1.5 inches.

(4) The human foreskin, during sexual intromission, is completely within the vagina (whereas the pongid penile sheath is not).

These four differences must have occurred since the Pongid-Homo split and are germane to this inquiry. A fifth difference would include the lack of a baculum (a bone rod within the penis) in the hu-

man penis. This lack is noted, but is not seen as relevant to present discussion (see Dixson (1987) for a compendium on primate penises; see Harcourt (1995) for a discussion of evolutionary pressures on male primate genitalia).

As *Australopithecus* evolved into *Homo*, a number of sexual/reproductive strategies (co)emerged, e.g., female orgasm, pair-bonding, hidden ovulation, continuous female receptivity, reduced sexual dimorphism. The determination of the direction in which each cause-and-effect relationship occurred is well beyond the scope of this inquiry. Nonetheless, it seems reasonable that, correlated with these traits, a broadened, hairless, fore- (rather than aft-)skin, which completely enters the vagina, emerged and stabilized within the genus *Homo*. To account for this complex of traits, the following, hypothesized, sequence is proffered.

- (a) A hairless, compared to hirsute, penile sheath presents less mechanical difficulty in entering the vaginal canal. The penile sheath, by definition, would be broader than the enclosed penis.
- (b) The relatively wider penile sheath would offer greater stimulation to the woman than the more slender, filiform penis as exemplified by the chimpanzee. Women who enjoyed the greater stimulation would, thereby, more often select as mating partners the men who possessed those attributes (a hairless foreskin which entered the vagina). It should be noted that changes, i.e., elongation, in the chimpanzee penis could be attributed to "sperm wars" such that a reproductive advantage is accrued to a male chimpanzee with the mechanical advantage of a longer penis (see Smith, 1984, and Ridley, 1993 for examples and discussion). However, the advantages in the widened penis of men seem unlikely to lie in the realm of a superior mechanical sperm delivery

system. Therefore, it is suggested that the increased diameter of the man's (compared to the chimpanzee's) penis was selected by women, for the women (and as a derivative, for the men).

- (c) The selection would then occur for an elongation of the (wider) sheath with the prepuce migrating distally down the penile shaft. The distal migration continued until the prepuce reached the area of the glans penis. The prepuce would then be a foreskin (rather than an aft-skin). This distal migration would result in a hairless widened penis wherein the entire foreskin—which truly had become a *foreskin*—would completely enter the vagina during coitus.

The selection for a widened diameter of the penile sheath might have occurred without an initial "fusion" of the penis with the penile sheath. The preputial sac (the space between the prepuce and the shaft of the penis) could simply have become elongated.

However, over and beyond any mechanical difficulties in maintaining stability (especially without a baculum), a lengthened preputial sac would create a large, warm, moist space which becomes an excellent medium for micro-organisms, e.g., bacteria and subsequent diseases. Diseases most relevant to this argument would be sexually transmitted diseases (STD's). It is interesting to note that STD's have not been reported in feral great apes. Either STD's are not normative in the great apes or have simply not been sought, hence not found (see Phillips-Conroy et al., 1994) for a discussion on the lack of STD data on feral primates. Current, and arguably archaic, STD's create a number of reproductive problems, e.g., infertility on the part of males and (especially) females (Westrom

and Mardh, 1990; Westrom et al., 1992; Hook and Handsfield, 1990) infant morbidity/mortality (Burnham et al., 1990; Schulz et al., 1990; Gutman and Wilfert, 1990), and ectopic pregnancy (maternal mortality) (Lurie, 1992).

Nocturnal erections, normative in human men during REM sleep would serve to expose the linings of the penis and foreskin to air/oxygen and act as a drying agent. Both events would make the medium of the elongated preputial sac less hospitable to micro-organisms, e.g., bacteria which cause gonorrhea. The exposure can kill the micro-organisms or curtail their rate of reproduction. Again, the question of cause and effect would be moot. Whether this anti-pathogenic function would have generated nocturnal erections or simply reinforced the survival value of the already present trait is not germane. What is germane is that nocturnal erections would diminish the threat of infections stemming from a fairly new anatomical, if transitional, feature: an elongated preputial sac.

Thus, consequences of the reformatted penis would result in an increased stimulation of the woman and, in general, men are not loathe to increase the stimulation of women. Women would have enhanced satisfaction. Men would have enhanced satisfaction. So—in the face of such putative gender egalitarian joy—why would any cultural tradition emerge and stabilize and be maintained which would mandate the systematic removal of the foreskin? In other words: What might be the societal benefits of circumcision which would outweigh the costs to that individual or to that society? Framed more concisely: why lop off the foreskin? The next section develops an answer to the question.

BIOLOGICAL AND CULTURAL CONSEQUENCES OF CIRCUMCISION

Biological consequences of circumcision.—The relevant and spare literature which deals with the (human) prepuce tends to refer (tacitly) to the human foreskin as a mere flap of skin. Anatomically, however, this description is not accurate. The intact human foreskin is richly innervated and contains holocrine glands (e.g., Tyson's glands) (see Sommerova, 1976; Halata and Munger, 1986; and Dail and Evan, 1974 for reviews of the development of sensory nerve endings in the human penis). In terms of surface area, the human foreskin represents approximately 36 per cent—more than a third—of the intact penis (Ritter, 1992). As a facet of the man's reproductive apparatus, the foreskin seems to be nontrivial.

Given that "pleasure," "feeling," and "sensation" are all solidly localized within the brain, if circumcision were to affect the neural organization of the brain, then subsequent sexual reactions, e.g., "sensations," would also be affected. Studies on the triangulation of the foreskin and the central nervous system and circumcision have yet to be conducted or, at least, are not easily findable. Nonetheless, inferential evidence is available.

Lesions and cortical reorganization.—When Jackson and Diamond (1981) severed sensory nerves from a monkey's hand to its somato-cortex (the area in the brain where "touch" is received), there was no recovery of responsiveness to the denervated skin. This lack of responsiveness to touch from the "deadened" skin was apparently because those nerves which were still intact have a very limited capacity to sprout and to reclaim vacant territory. Florence et al. (1988) noted that nerve regeneration is often incomplete

and disorderly and that the remaining area of the somato-cortex becomes reorganized. Large zones of such "silent" cortex persisted over time. Similar reorganization of the cortex after amputation of a digit or after severing nerves has been reported for cats (Metzler and Marks, 1979; Kalaska and Pomeranz, 1979), raccoons (Welker and Seidenstein, 1959; Kelahen, et al., 1981), and rats (Wall and Cusick, 1984).

Some research has also been conducted with primates with similar results. For example, when nerves which innervated the hand of a macaque monkey were severed, cortical sensory areas which serve that hand did not recover responsiveness to cutaneous—"touch"—stimuli (Wall and Kaas, 1986; Huerta and Wall, 1987).

It appears that any sensory deprivation of a system can also lead to cortical changes. For example, Kandel (1991, p. 1024) noted in his work with ocular dominance:

If one eye is closed during a critical period, the columns (of neurons in the visual cortex) devoted to that eye shrink while those devoted to the open eye expand. This modifiability of the ocular dominance columns is restricted to a relatively short period just after birth . . .

See Jessell (1991) for an overview of neuronal reactions to injury. It is also useful to note that the "phantom limb" phenomenon (Melzack, 1992) has not been reported/found in regards to the circumcised foreskin.

In a review of the literature on the plasticity of sensory maps, Kaas (1991) offered the following synopsis:

(a) Reorganization of sensory maps in the brain follows changes in neural activity patterns caused by the relative inactivation

of (feed forward) pathways produced by lesions or by the removal of the (i) sensory surfaces, (ii) peripheral nerves, or (iii) more central structures.

- (b) Sensory maps in the brain, both early and late in processing hierarchies, are mutable, but such changes are more dramatic in higher stations. The increased level of change in these higher areas, closer to the cortex, may be because of the accumulation of serial changes and/or the greater potential plasticity.
- (c) Sensory maps in the somato-sensory, visual, and auditory systems in the brain are all capable of change.
- (d) Sensory maps within the brain have been shown to change in a wide range of mammalian species. The clear implication is that adult plasticity is a feature of all mammalian brains. And, as a large reservoir of data demonstrates, the younger the individual is, the greater is the plasticity in the development of nervous system (see Kandel et al., 1991, for examples).
- (e) There is presently little evidence related to the *behavioral* consequences of the reorganization of "maps" in the brain. Nevertheless, partial recoveries of lost abilities which follow central damage include the possibilities of alterations and improvements in sensory skills.

Synopsis.—Framed a little differently within the context of circumcision, the removal of the foreskin would be expected to reorganize the brain's somato-cortex of the affected individual. Because sexual stimuli normally travel first to the cerebral cortex and then to sub-cortical areas, e.g., septum (Bennett, 1982), any reorganization of the cerebral cortex would be expected to affect the overall sexual behavior of that individual (cf. Masters and Johnson, 1966). The earlier in the male's life that the circumcision would occur,

the more impact that the ablation would have upon his nervous system, and hence his behavioral tendencies.

It is argued here that a removal of the foreskin from an individual has consequences in that person's brain. The removal of the foreskin—part of the male's reproductive apparatus—is hypothesized to affect sexual excitability. The most intuitive direction of any change would be to lower excitability or to raise the threshold for sexual arousal.

Circumcision and skin texture.—A derivative of circumcision is that keratinization or desensitization of the surface epithelium of the glans penis occurs. In other words, if the moistening protective covering of the glans penis is removed, then the skin on the surface of the glans penis would dry out and become toughened/cornuate/"calloused." Again, the end result is a desensitization of the man's reproductive tissues. Excitability would be lowered, and the threshold for sexual arousal would be raised.

Circumcision and pheromones.—In addition, the human foreskin, as well as the penis proper, contains Tyson's glands (a type of holocrine gland) which secrete smegma. Smegma is a substance which is volatile and may act as a pheromone. During the man's sleep, such a pheromone would be systematically released via nocturnal erections. Nocturnal erections occur systematically in the sleep cycle and are usually associated with REM sleep (Arnoff, 1991) (see Hobson et al., 1978, for a discussion of the ethology of the sleep cycle; see Rogel, 1978, and Stoddart, 1991, for a discussion of human pheromones). This nocturnal release of the odoriferous segments of smegma, if nothing else, would give an olfactory signal that a man was a current resident in

the sleeping quarters. A diurnal release in the presence of a nubile female may also prove distracting to the woman who, in turn, may reciprocate with distracting signals of her own. Circumcision removes the foreskin which, in turn, removes those Tyson's glands. The removal of the Tyson glands precludes smegma being secreted from them. This preclusion would markedly reduce any pheromonic signals from occurring and thereby would act to lower excitability quotients within the male hierarchy and between the genders.

That is, to the extent that the olfactory signals are minimized, social friction or jostling for dominance among men may be similarly reduced. Framed differently, if sleeping quarters are constricted by space and weather, e.g., a small domicile in winter, then male pheromones which essentially signal to other males to stay away can create irritation and social friction when the other males are prevented from staying away. A removal of the pheromones would remove the signal and, hence, would remove any hostile reactions to the signal. Overall social friction within the group would be reduced. In addition, young men are easily distracted by and excited by young women. Any reduction of sexual signaling between the two genders would auger for enhanced group pacificity.

Circumcision and tribal competitiveness.—If the above has a kernel of truth, then the following scenario seems reasonable. Young men in every tribe represent a source of potential turmoil and disruption within the social fabric. Any vector which would reduce—not eliminate, just reduce—the incorrigibility of young men would give that group a competitive edge. In other words, a marginal increase in the tractability of young men gives that soci-

ety a competitive advantage in group cooperation when compared to a society which has more easily distracted young men (see Young, 1962, for a complementary argument from a Freudian perspective). Said more explicitly, circumcision is a (low grade) neurologically mediated analogue to castration. Circumcision lowers sexual excitability/distractibility without lessening sexual potency or levels of aggression. Potency is needed for the next generation. Aggression is needed for successful defense of the group against the forays of young men from alternate groups. The earlier in the male's life that circumcision would occur, the more effective would be the results. It is also the case that infant boys would generate less effective protestations against the procedure. To the extent that humans *are* affected by pheromones, the impact of pheromones, e.g., smegma, emanating from the prepuce would be similarly reduced.

Circumcision and sexually transmitted diseases.—The debate on the current relationship between the status of the foreskin and sexually transmitted diseases is somewhat relevant. The bulk of the evidence seems to find little net gain in preventing disease by being circumcised or not being circumcised (Wallerstein, 1985; Bigelow, 1991; Cook et al., 1994; Persky, 1977; Spach et al., 1992; cf. Caldwell and Caldwell, 1996). Accordingly, the rationale for circumcision which is based on medical reasons *for the man* may more reflect a folklore which, in turn, relies on the "medical model" to justify a needed and mandated behavior rather than the reverse: therapeutic medical procedures which, because of their effectiveness, are inserted into the folk wisdom of a community.

If, however, the current consequences of an infection, rather than the infection

itself, are reviewed, then a somewhat different picture emerges. Some infections, such as herpes, are independent of a man's circumcision status. Other infections, such as genital warts, seem to increase in incidence *with* circumcision. Additional infections, such as AIDS, syphilis, and gonorrhea are decreased with circumcision (Cook et al., 1994; Caldwell and Caldwell, 1996). These STD's are not only deleterious to the infected man, they also—when transmitted to the woman—create a relatively rapid and adverse impact upon the woman's fertility, e.g., infant morbidity/mortality (Holmes et al., 1990; Schulz et al., 1990), infertility through occluded fallopian tubes (Moore and Cates, 1990; Westrom et al., 1992), and maternal deaths through ectopic pregnancies (see Lurie, 1992, for an excellent discussion on the lethality of ectopic pregnancies prior to twentieth century medical advances). Whereas a number of infected men may create an inconvenience in a society or tribe, a number of infected women represent a clear threat to the sheer continuity of that society or tribe over many generations. Accordingly, the dynamics, if any, among the (i) health of men, (ii) the fertility of women, and (iii) circumcision may be quite complex. Nonetheless, to the extent that circumcision—by reducing the incidence of STD's—would have reduced infertility as well as infant mortality/morbidity, then the greater the chance that circumcision would have emerged and stabilized as a tradition within the germane group or tribe.

Circumcision and folklore.—The preceding analysis, which is fairly complex, would be possible to insert into the oral folklore of any tribe or group. Indeed, the Rabbi Moses Maimonides (cited in Ritter,

1992) did make such an argument in the thirteenth century vis-a-vis the Jewish version of circumcision:

The bodily injury caused to that organ is exactly that which is desired; it does not interrupt any vital function, nor does it destroy the power of generation. Circumcision simply counteracts excessive lust; for there is no doubt that circumcision weakens the power of sexual excitement . . .

However, such an analysis is somewhat cumbersome to explain to anyone under any circumstances. For a growing pre-pubescent child to inculcate the verities of this explanation stretches the imagination of even the most inventive. A much more pragmatic approach to transmit the message across generations, from adults to children, would be to embed "circumcision" within the rubric of the holy, the supernatural, and the wishes/demands of ancestors.

In other words, the explanation or rationale in the young child's experience is that circumcision must occur because it must occur, because it must occur, because it must occur. The eventuation of the phenomenon would be cultural given, with no further reason given nor solicited. Such imagery of an uncontested worldview is then supplemented with elaborate ritual, with group consensus, and with the juggernaut of inertia. All these facets within the young child's culture would be mutually supportive and logically consistent with each other. For example, as children become socialized in Western Europe and its extensions, they learn that "B" follows "A" because it does, and "7" follows "6" because it does. No further explanation is asked or is given. It is!

Lack of the universality of circumcision.—With the assumption that the

above discourse has some validity, the question would then become: Why have not all cultures embraced and employed circumcision?

The answer can take several forms. Alternate cultural forms of the containment of young men's ardor are certainly available (e.g., warrior castes). Some groups may have young men whose youthful enthusiasm may be below a threshold which would trigger a drastic physical intervention, e.g., the Japanese and Eskimos seem to be such groups (Freedman, 1974, 1979; LeVine, 1975; Orlick et al., 1990; Vernon, 1982). Indeed, circumcision is not a feature native to northern climates. Unraveling such a putative relationship between climate/ecology and level of circumcision becomes an interesting question.

SUMMARY

"Circumcision" is suggested to reduce young male's sexual excitability and distractibility. The advantages to the commonweal of more tractable, less disruptive young men seem intuitively real. Group endeavors involving the strength and large numbers of young men would be more easily initiated, organized, and executed. Disruptions of a sexual nature are (slightly) reduced. Given (1) the facile manner in which humans can create and grasp metaphor and (2) the importance of early learning in childhood upon subsequent behavior, the nesting of the physical act of foreskin removal within a ritualistic imagery seems pragmatic and efficacious.

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