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EFFECT OF NEONATAL CIRCUMCISION ON PENILE NEUROLOGIC SENSATION

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ABSTRACT

Objectives. To evaluate penile sensory thresholds in neonatally circumcised and uncircumcised men.

Methods. We evaluated 125 patients, 62 uncircumcised men and 63 neonatally circumcised men. All patients completed the Erectile Function domain of the International Index of Erectile Function questionnaire. Of the 125 patients, 29 (International Index of Erectile Function score of between 25 and 30) were placed in the functional group, and 96 in the dysfunctional group. The patients were tested on the dorsal midline glans of the penis (foreskin retracted). Quantitative somatosensory testing was performed and included vibration, pressure, spatial perception, and warm and cold thermal thresholds.

Results. In the functional group, *t*-test analysis demonstrated a significant ($P < 0.001$) difference, with worse vibration and better pressure sensation for uncircumcised men. When controlling for age, hypertension, and diabetes, all *t*-test significance was lost. In the dysfunctional group, circumcised men (49 ± 16 years) were significantly younger ($P < 0.01$) than uncircumcised men (56 ± 13 years). For the dysfunctional group, *t*-test analysis also demonstrated worse vibration sensation for uncircumcised men ($P < 0.01$). Again, when controlling for age, hypertension, and diabetes, all *t*-test significance was lost.

Conclusions. We present a comparative analysis of uncircumcised and circumcised men using a battery of quantitative somatosensory tests that evaluate the spectrum of small to large axon nerve fiber function. Our study controlled for factors, including age, erectile function status, diabetes, and hypertension, that have been shown to alter neurologic testing. In our study of neonatally circumcised men, we demonstrated that circumcision status does not significantly alter the quantitative somatosensory testing results at the glans penis. UROLOGY **65:** 773–777, 2005. © 2005 Elsevier Inc.

A long-standing controversy has surrounded the issue of male penile circumcision. Currently, no consensus has been reached about what the recommendation should be for circumcision. The American Academy of Pediatrics believes that existing scientific evidence demonstrates potential medical benefits for newborn male circumcision; however, these data are not sufficient to recommend routine neonatal circumcision.[1] The American Academy of Family Physicians recommends that physicians discuss the potential harms and benefits of circumcision with all parents or legal guardians considering circumcision.[2] Finally, the American Urological Association believes that neonatal circumcision has potential medical benefits and advantages, as well as disadvantages and risks.[3] Inevitably, the decision to perform neonatal circumcision resides with the parent or legal guardian.

Members of society often cite several indications for circumcision, including custom, beauty, and promotion of health.[4] Current therapeutic indications for circumcision include trauma, phimosis, paraphimosis, decreased risk of penile or cervical cancer, and a decreased incidence of neonatal urinary tract infections.[1,4] These reported advantages must be weighed against the complications of circumcision, including infection, bleeding, adhesions, meatal stenosis, amputation of the distal glans, as well as other more rarely reported problems.[1,4]

Although everyone acknowledges the acute sur-

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Submitted: September 20, 2004, accepted (with revisions): November 3, 2004

0090-4295/05/$30.00
doi:10.1016/j.urology.2004.11.007

gical complications of circumcision, controversy continues to exist about the effect of circumcision on penile sensitivity and sexual satisfaction. One of the earliest reports about sensitivity from Masters and Johnson[5] found no significant differences between the uncircumcised and circumcised glans with respect to exteroceptive and light tactile discrimination. Other investigators believe that penile sensation may be decreased in circumcised men.[1,6]

This study was designed to evaluate the penile sensitivity in both circumcised and uncircumcised men. We evaluated both large and small axon fibers with sensitivity measurements, including vibration, pressure, spatial perception, and warm and cold thermal thresholds. We performed these measurements in both functional men and men with erectile dysfunction (ED) to evaluate further for differences in penile sensitivities.

MATERIAL AND METHODS

The institutional review board for the protection of human subjects in research at Montefiore Medical Center approved all procedures. Any person unable to understand English was excluded from participation. After each subject provided informed consent, a medical history was recorded with a focus on any history of diabetes or hypertension. These procedures have been described previously[7] and are repeated briefly below.

A total of 125 patients were recruited from the Department of Urology in 2001 to 2003. Normal controls were sent for urologic evaluation of problems not relating to ED, and other physicians typically referred patients with complaints of ED for evaluation at our clinic. Only men who had been neonatally circumcised were included in the circumcised group.

All participants were asked to complete the Erectile Function domain of the International Index of Erectile Function (IIEF) questionnaire.[8,9] A normal score on the IIEF is between 25 and 30, and a score of less than 25 identifies those patients with ED.[8,9]

Sensory evaluations were obtained in all subjects, with all tests performed by the same two researchers (C.B.B. and J.D.F.). Measurements were recorded on the dorsal midline glans of the penis half way between the coronal sulcus and the urethral meatus. In uncircumcised men, the foreskin was retracted, and the measurements were taken as above. In uncircumcised men, an additional measurement was taken at the dorsal midline "foreskin," with the prepuce in its natural position over the glans. All thresholds were obtained using a modified ascending method of limits or a two-alternative forced-choice procedure.[10]

Vibration was determined using a Bio-Thesiometer (Bio-Medical Instrument, Newbury, Ohio). A galvanometer was used to measure the intensity of a stimulus frequency fixed at a 120-Hz signal. The subject identified the minimal energy at which he could distinguish between vibration and static touch.[11] The thresholds were recorded from the glans as above.

Sensitivity to touch was determined using the Semmes-Weinstein monofilament technique (North Coast Medical, Morgan Hill, Calif).[12–14] In brief, subjects were touched at the test site by a series of monofilaments of ascending intensity. Threshold was defined as the smallest stimulus intensity correctly identified as a definite sensation of light pressure. Filaments were applied perpendicular to the skin for a period of approximately 1.5 seconds. The intensity of the stimulation increased from 0.07, 0.4, 2.0, 4.0, 10, and 300 g, sequentially. The target forces of 0.07 g and 0.4 g were repeated for a total of three trials before the higher intensities were examined successively. The thresholds were recorded from the glans as above.

The spatial perception threshold was determined using the tactile circumferential discriminator (Wyeth-Ayerst International, Westown, Pa). This device consists of a series of eight aluminum rods that vary in cross-sectional diameter.[13] The subject was initially presented with a reference rod (labeled 0) placed firmly against the skin for a period of approximately 2 seconds and then with a "test" rod (numbered 1 to 7) that differed in circumference. The threshold was determined as the smallest difference in circumference that could be reliably detected on four consecutive trials. This procedure evaluated the spatial properties of sensation (ie, minimal separation, number, and distribution of activated receptors) and was similar to the measurement of two-point discrimination thresholds. The thresholds were recorded from the glans as above. A subject unable to differentiate between rod 7 and rod 0 was assigned the highest threshold (ie, score of 8).

The hot and cold thermal thresholds were determined using a two-alternative forced-choice procedure.[15–17] At each site, the subject was presented with a thermal signal generated by a Physitemp NTE-2A Thermal Sensitivity Tester (Physitemp Instruments, Clifton, NJ). The stimuli were pressed against the skin using a hand-held thermal probe. The probe was set to an acclimation temperature of 32°C,[15–17] and all comparisons were made against this reference. The temperature was increased at increments of 1°C until the patient was able to identify correctly which temperature was warmer four consecutive times. That temperature was then recorded as the thermal threshold for warmth. The same procedure was followed for cold discrimination, with the temperature decreased at increments of 1°C. Not all subjects elected to participate in the thermal assessments because of time constraints. The thermal thresholds were determined in 67 subjects (55 with ED and 12 normal).

Statistical Analysis

The following parameters were evaluated: age, history of diabetes, history of hypertension, measurement of tactile circumferential discrimination of the glans, biothesiometry of the glans, Semmes-Weinstein monofilament measurement of the glans, and warm and cold temperature threshold of the glans. Analysis for the Semmes-Weinstein monofilament was performed with the corresponding value of force in grams. Univariate distributions were assessed for normality. Bivariate relationships were assessed using chi-square, *t*-test, and Pearson correlations. Composite null hypotheses were assessed with mixed models repeated measures analysis of variance using Statistical Analysis Systems PROC MIXED, version 8.1 (2001), allowing us to control for age, diabetes, and hypertension.

RESULTS

Sample

In the cohort evaluated, 29 subjects (23%) scored within the normal range and constituted the normal group. In the normal group, the uncircumcised men were 43 ± 14 years old and the circumcised men were 51 ± 16 years old. The other 96 subjects (77%) had evidence of ED by history (dysfunctional group). In the ED group, the uncircumcised men were 56 ± 13 years old, and the circum-