

COMMENTARY

Long-Term Consequences of Castration in Men: Lessons from the Skoptzy and the Eunuchs of the Chinese and Ottoman Courts

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Castration of men and males of other species was almost certainly the first experiment in endocrinology (if not in zoology), and the literature on the subject is vast. Indeed, the Cumming Manuscript Collection of the New York Academy of Medicine Library contains more than 1200 references, abstracts, and documents concerning the early history of human castration (1). In antiquity the procedure was performed for several reasons, including as punishment for prisoners of war (2), and by the time of Aristotle in the fourth century BC the physiological consequences of male castration were understood with remarkable exactitude (3). "Some animals change their form and character, not only at certain ages and at certain seasons, but in consequence of being castrated; and all animals possessed of testicles may be submitted to this operation. Birds have their testicles inside, and oviparous quadrupeds close to the loins; and of viviparous animals that walk some have them inside, and most have them outside, but all have them at the lower end of the belly. Birds are castrated at the rump at the part where the two sexes unite in copulation. If you burn this twice or thrice with hot irons, then, if the bird be full-grown, his crest grows fallow, he ceases to crow, and forgoes sexual activity; but if you castrate the bird when young, none of these male attributes or propensities will come to him as he grows up. The case is the same with men; if you mutilate them in boyhood, the later-growing hair never comes, and the voice never changes but remains high-pitched; if they be mutilated in early manhood, the later growth of hair quit them except the growth on the groin, and that diminishes, but does not entirely depart. The congenital growth of hair never falls out, for a eunuch never goes bald. In the case of all castrated or mutilated male quadrupeds the voice changes to the feminine voice. . . All animals, if operated on when they are young, become bigger and better looking than their uncastrated fellows; if they be mutilated when full-grown, they do not take on any increase of size. If stags be mutilated when, by reason of their age, they

have as yet no horns, they never grow horns at all; if they be mutilated when they have horns, the horns remain unchanged in size, and the animal does not lose them. . . As a general rule, mutilated animals grow to a greater length than the uncastrated (3)."

In contrast to the rapidity and sophistication of the early advances, studies of the physiological effects of castration in more recent times have been relatively limited (presumably because fewer castrated men are available for study), and most studies of androgen deficiency focus on hypogonadal states rather than castration (4). However, in the 1940s, Hamilton and his colleagues did pioneering work in the United States on mentally deficient men who were castrated as a consequence of eugenics laws, quantifying the effects on skeletal development, hemoglobin production, and metabolism (5), and Bremer subsequently defined the relation between testicular secretions and male sexual drive and function in men who were castrated in Norway because of sexual offenses (6). Most studies of castration in men have involved relatively short term experiences (usually men who had been castrated for less than a decade), but in the 20th century the effects of long term castration have been studied in three groups of men: the Skoptzy and the court eunuchs of the Chinese and Ottoman empires (Table 1). According to Penzer (7) three varieties of eunuchs were recognized in antiquity: 1) castrati, clean-cut, both penis and testicles were removed; 2) spadones, testicles only were removed; and 3) thlibiae, testicles were bruised and/or crushed. The three groups of eunuchs under consideration in this review fall into the castrati category.

The Skoptzy

The Skoptzy (or Skoptsy, meaning the castrated), also called the White Doves, were a Christian sect whose male members, to attain their ideal of sanctity, subjected themselves to castration. Their origin in the 18th century, their spread through a large part of Russia and into Romania and Bessarabia, the attempts by the Russian government to suppress the movement, and the theological underpinnings of the religion were described by Pelikan (8), Grass (9), and Pittard (10). Because they believed that the second coming of Christ would occur only when the number of Skoptzys

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TABLE 1. Medical studies of men after long term castration

Group	Author(s) and Ref.	Date of publication	No. of subjects	Average age (yr)	Average duration of castration (yr)
Skoptzy	Tandler and Grosz (12)	1910	5	30	18
	Koch (13)	1921	13	64	30
Chinese court eunuchs	Wagenseil (19)	1933	31	57	38
	Wu and Gu (25, 26)	1987, 1991	26	72	54
Ottoman court eunuchs	Wagenseil (33)	1927	10	43	34

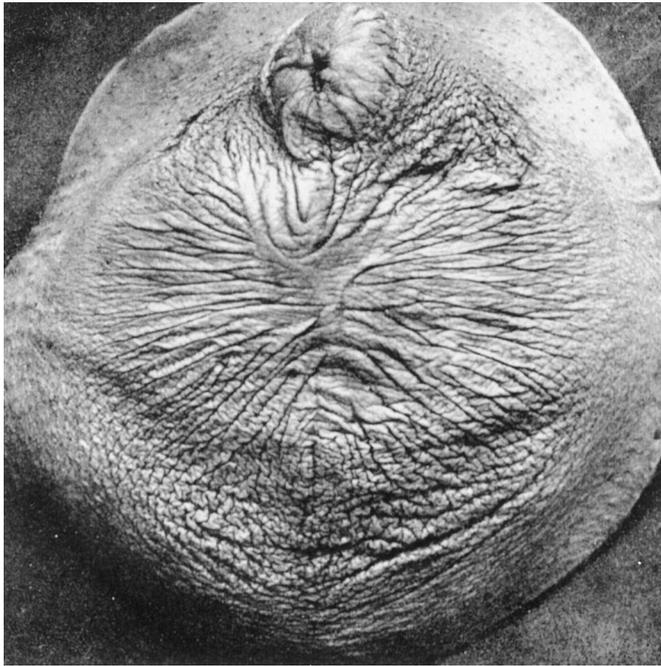


FIG. 1. Anatomical preparation of the external genitalia of a Skoptzy man who had received the greater seal. Reprinted from Koch (13).

reached the apocalyptic number of 144,000, they became ardent proselytizers. Their critics claimed that they used coercion among children and prisoners, a charge that seems warranted in view of the fact that many were castrated below the age of 10 yr, but others were religious enthusiasts who underwent the procedure voluntarily as adults. Male members of the sect were encouraged to take either the “great seal” (removal of the penis, the scrotum, and the testes) or the “lesser seal” (removal of the scrotum and testes, leaving the penis intact). Women were not castrated, but were subjected to mutilation of the breasts and external genitalia. In men the procedure was of great simplicity; namely, the operator seized the parts to be removed with one hand and struck them off with the other. In the early years of the sect the surgical instrument was a red-hot iron rod or poker (hence the expression baptism of fire), but instruments of castration included pieces of glass, razors, and knives. A cicatrix formed, with healing in 4–6 weeks (Fig. 1). In some instances the procedure was performed in stages (taking the lesser seal before the great seal). When the penis was removed, nails were inserted into the urethra to avoid strictures, and such men were said to urinate while sitting or squatting. Many Skoptzys were deported to Siberia, where they formed settlements, and the sect continued to perform castrations as

late as 1927 (11). Persecution of the Skoptzys persisted into the Soviet era, and during the antireligious fervor in 1929–1930 they were subjected to sensational public trials and publicity. It was estimated that there were between 1000 and 2000 Skoptzy in Soviet Russia in 1930, 500 of whom lived in Moscow, but by 1962 none were thought to be alive (11).

Medical studies on the Skoptzy. Medical studies were performed on the Skoptzy by at least three different groups of investigators. At the turn of the century Pittard made measurements in 30 Skoptzy men in 1 Romanian village and noted that they appeared to be taller than their peers (10). In 1907 Tandler and Grosz examined 5 Skoptzy men in Bucharest whose average age was 30 yr and who had been castrated between ages 5–21 yr (12). Subsequently, during the German occupation of Romania in the First World War Walter Koch studied 13 Skoptzy men, all between 50 and 94 yr of age (averaging 64 yr), who had been castrated for an average of 46 yr (13). A variety of anthropomorphic measurements were made, and skull x-rays were obtained in some (13).

The eunuchs of the Chinese court

The practice of employing eunuchs as court functionaries in China and in other oriental countries goes back into pre-history (14). The procedure by which the Chinese court eunuchs were castrated in the late 19th century during the Qing dynasty was described in some detail by Stent in 1878 (15), and subsequent descriptions of the practice, including those by Korasow (16), Matignon (17), and Wong and Wu (18), appear to be paraphrases of Stent (15). However, on the basis of published interviews of surviving eunuchs, the surgical procedure appears to have been essentially the same in the later days of the dynasty (14). Possession and employment of eunuchs as servants in China were reserved for the imperial family and the 8 hereditary princes. The emperor maintained approximately 2000 in his service, the imperial princes and princesses each had about 30, and various family members were allowed 10 or so eunuchs each. On occasion, the castration was punitive, as in prisoners of war, but most were performed voluntarily in adults who, because of poverty or laziness, underwent castration to gain employment (usually as young adults, but sometimes in men after having born children) or in children under compulsion who were sold by their parents for the purpose of castration (15).

Specialists (termed knifers) performed the operation in an establishment maintained outside one of the palace gates in the imperial city, and the trade was handed down from father to son. The subject reclined on a broad bench, and the genitalia were anaesthetized with a secret agent known only to the surgeon. Two assistants held the spread legs, and a third

assistant secured the arms. The surgeon stood between the legs armed with a curved knife (Fig. 2a), grasped the scrotum and penis with his left hand, and asked the candidate or his parents to consent to the procedure. If the answer was yes, the genitalia (scrotum, penis, and testes) were removed with a single cut. A plug made of pewter (Fig. 2b) was introduced into the urethra to prevent stricture formation. The wound was washed three times with a solution of boiled pepper and covered with a piece of soft, moistened paper. With the support of two assistants the subject was made to walk around the room for 2–3 h. For the following 3 days, the subject was not allowed to drink liquids or to urinate. On the fourth day, the dressing and plug were removed, and if the subject was able to urinate the operation was considered a success. Healing took approximately 100 days, and eventually all that was left was a contracted scar (Fig. 3). Urinary retention was treated with drugs, and if it persisted the surgeon beat the patient on each visit. Complications included hemorrhage, infection, and extravasation of urine, but death was rare (estimated at around 2%). Until convalescence was completed the pewter plug was only removed to allow urination. With time the opening of the urethra could become narrowed despite the use of dilators, resulting in urinary dribbling or retention, urinary tract infection, and

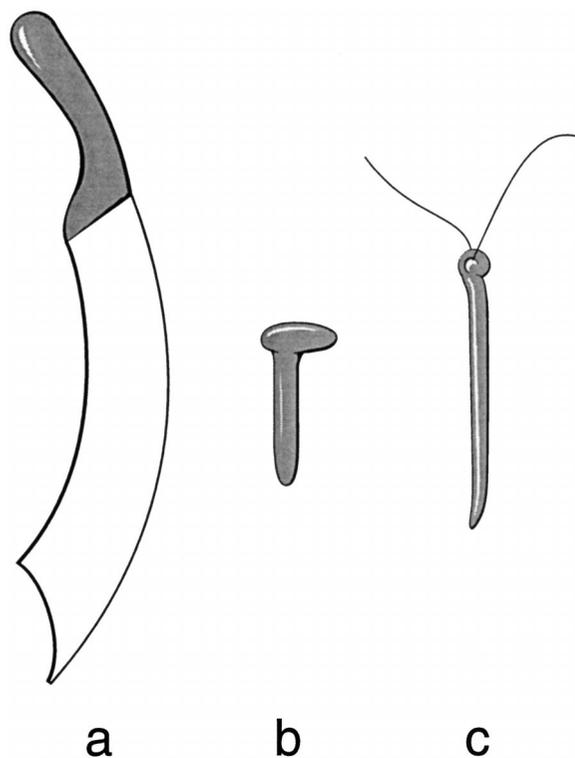


FIG. 2. Some of the instruments used for creating and treating eunuchs. a, Scalpel used by knifers for the removal of the external genitalia of the Chinese eunuchs (the blade is described as 3.7 in. in length, and the handle as 2 in. in length.) Redrawn from Wong and Wu (18). b, A urethral dilator for insertion into the urethra of the Chinese eunuchs (3 cm long and 0.9 cm in the widest portion of the plug). Redrawn from Matignon (17). c, A urethral plug used to prevent incontinence in the Ottoman Court eunuchs (5 cm long). A string was placed in the eye to prevent it from slipping into the bladder. Redrawn from Millant (31).



FIG. 3. External genitalia of a young eunuch of the Chinese court. Reprinted from Matignon (17).

bladder stones. Urinary incontinence was said to be common and caused a characteristic odor in the unfortunate victims. The stoma sometimes required dilatation long after the castration (16–18). [According to Wagenseil, other castration techniques were sometimes used, each involving the removal of all the external genitalia (19).]

The amputated penis, testes, and scrotum, termed “the precious” or “the treasures,” were preserved in alcohol and either stored by the knifer or kept by the subject (15–16). Genitalia retained by the knifers were kept in jars labeled to indicate from whom they came and when the amputation was performed. The eunuchs were required to show the preserved genitalia to a special court official at each promotion (“inspection of the precious”) to document the completeness of the operation, and eunuchs who, through carelessness or misadventure, lost the items had to borrow or rent them for display at the time of promotion. Each eunuch was buried with the preserved genitalia, because of the religious need to be as complete as possible when departing into another world.

The palace eunuchs were divided into 48 departments (for looking after gardens, courtyards, kitchens, armory, furniture, etc.) Each department had a superintendent, usually of

the sixth grade, and a chief eunuch served over the entire complement of eunuchs. At least in the last phase of the Qing dynasty, eunuchs were subject to the Imperial Household Department, which was not headed by a eunuch (20). Most Chinese eunuchs were castrated as adults, but eunuchs castrated before the age of 10 yr were considered 'thoroughly pure' and were prized as personal servants. All eunuchs received a regular stipend as well as room and board. Most lived in the palaces until they were released from service in old age. Some spent their final days in monasteries. Those who had families and children before castration rejoined their families, and others married and adopted children. The most frequent marriage partners were palace maids; such wives were referred to as 'companions sitting at meals' to indicate a platonic relationship (21). [George Kates, an American, rented a house in the Imperial City in Beijing from one such couple in the 1930s, the wife having been a maid to the dowager empress (22). This couple survived until the Cultural Revolution of 1966–76, the wife dying of malnutrition, and the husband disappearing after being deported to the countryside (23).]

After the revolution of 1911 the emperor Pu Yi retained figurehead status and continued to reside in the Forbidden City. According to the articles of agreement with the new government, the existing eunuchs continued to be employed in the Imperial Household Department (20). However, on July 15, 1923, the entire staff of eunuchs (with the exception of about 50 household servants of elderly members of the imperial family) was expelled from the Forbidden City because they were suspected of stealing and selling furniture and works of art and were believed to have burned a portion of the edifice as a protest against a planned inventory of the palace treasures (20). Although there is disagreement as to whether the eunuchs were responsible (14, 20), corruption in the Imperial Household Department was pervasive.

Medical studies on the Chinese court eunuchs. The expulsion of the eunuchs from the Forbidden City left most unemployed and many destitute. Ferdinand Wagenseil, from the Institute of Anatomy at Freiburg but then at Tungchi University in Shanghai, conducted anthropometric studies on normal men from northern China (24), and in 1930 he examined 31 eunuchs at the German Hospital in Beijing (19). The technique of study involved measurements of height, weight, and a variety of skeletal dimensions, radiographic studies of the skull, and descriptions of skin and body hair. The average age in this group was 57 yr, and the average duration of castration was 38 yr. In 1960 Wu and Gu (25, 26) performed careful physical examinations, including palpation of the prostate in 26 eunuchs (5 of whom had been castrated after the revolution of 1911) who lived in Beijing. The average age in the latter study was 72 yr, and the average duration of castration was 54 yr.

The eunuchs of the Ottoman court

The practice of employing eunuchs as palace functionaries in Constantinople (Istanbul) apparently began during the reign of the Emperor Justinian in the latter days of the Roman Empire and persisted through the Byzantine (27) and Ottoman eras (7). In contrast to China, ownership of eunuchs in

Turkey was not limited to the royal palaces; any citizen who could afford the purchase price was entitled. Some eunuchs of the Ottoman Empire were from Russia or the Balkans, but from the 16th century black eunuchs were in charge of the harem in the Ottoman court, most commonly individuals from Ethiopia or Sudan who had been castrated as children (28). Slave dealers kidnapped some, and some were sold into slavery by their parents. According to Penzer, stopping points were used by the slave exporters, and it was during the halts at such places that the castration of the boys took place (7). According to other reports many of the boys were castrated at a monastery in Upper Egypt where Coptic priests performed the operation (29, 30). The child was restrained on a chair; the phallus and scrotum were tied with a cord which was pulled taught, and the phallus, scrotum, and testes were removed as close as possible with a single stroke of a razor. Bleeding was stopped with boiling oil, and the wound was dressed with an extract of wax and tallow. In some instances hemostasis was achieved with hot sand, and the wound was dressed with an extract of acacia bark. The mortality was said to be high, only about one in three surviving. As in the case of the Skoptzy and the Chinese court eunuchs, a nail was introduced into the urethra to prevent stricture formation. The eunuchs squatted to urinate, and both urethral strictures and incontinence must have been common, because some eunuchs carried silver quills for self-catheterization, presumably because of strictures (7), and others used a removable plug (Fig. 2c) to prevent incontinence (31). Owing to the high death rate, the survivors were sold at high prices either to Turkey or to Persia (29). The physicians to the harem inspected the eunuchs on arrival to be certain that both penis and testes had been removed and reexamined them every few years to be certain that nothing was amiss (7). The eunuchs entered the court service at the lowest rank and passed successively through the grades of novice, middle grade, and highest rank. Strict rules of behavior were enforced for the eunuchs' guild. Some took to learning and literature and served as tutors to the royal children; others rose to high administrative ranks (28). Some 200 eunuchs were said to have lived in the palace of Topkapi in Istanbul after the royal family had moved to other palaces (28), and after the Turkish revolution the eunuchs continued to be devoted servants until the royal family was sent into exile in March of 1924 (32).

Medical studies on the Ottoman court eunuchs. Hikmet and Regnault appear to have made the first medical observations on the eunuchs in Istanbul in 1901 (30). During the first world war Ferdinand Wagenseil had been assigned as a physician to the German Red Cross Hospital in Istanbul, where he took care of a 40-yr-old eunuch from the harem who died after a febrile illness (presumably typhus) and subsequently examined 10 additional eunuchs, most of whom had voiding difficulties (33). An autopsy was performed on the man who died; the others (average age, 43 yr; average duration of castration, 34 yr) were subjected to detailed anthropological measurements and physical examinations, and skull x-rays were obtained on four of them.

The medical consequences of long term castration

Because the findings in the various studies overlap and are complementary, they will be discussed together.

Enlargement of the pituitary. Tandler and Grosz obtained an x-ray of the skull in a 20-yr-old Skoptzy man, who had been castrated at age 10 yr and observed that the sella turcica was grossly enlarged (12). Koch obtained x-rays of the skull in 10 Skoptzy men and reported that the pituitary glands were normal in size in 3, enlarged in 4, and "particularly" enlarged in 3 (13). In the latter group, there was also erosion of the dorsum sellae of the pituitary ("sattellehne"). The average duration of castration was the same in the 3 groups studied by Koch (46 yr), but the average age at which the castration was performed (11 yr) was younger in the group with the largest pituitaries. In his Istanbul study Wagenseil reported that 2 of 4 skull x-rays obtained revealed enlargement of the pituitary with thinning of the dorsum sellae; the average age at castration was 11 yr, and the average duration of castration was 44 yr in these 2 men (33). In the same study the pituitary was normal at autopsy in the 40-yr-old man who had been castrated for an uncertain duration (33). In his Beijing study Wagenseil obtained skull x-rays on 27 eunuchs and had them reviewed at the University of Bonn where "enlargement of the sella turcica could not be found generally" (19). The reason for the apparent discrepancy between the findings in the Chinese eunuchs and those in the Skoptzy and the Ottoman eunuchs is not clear, but it is of interest that the average age at which castration was performed was older in the Chinese group (average age at castration, 18 yr; less than a fourth had been castrated before age 14 yr). Subsequently, reactive hyperplasia of the pituitary was described in hy-

pogonadal men (34–36), including men with Klinefelter's syndrome (37). There is in addition at least one instance in which a large gonadotropin-secreting pituitary adenoma developed 35 yr after a man was castrated for cryptorchidism (38).

Skeletal changes. Tandler and Grosz described failure of closure of the epiphyses in the skeleton of a eunuch (39) and subsequently in a 35-yr-old Ottoman eunuch who had been castrated at age 8 yr (12). Koch reported that thinning of the bones of the skull was evident by x-ray in all of the Skoptzy men examined and that kyphosis was common (Fig. 4) (13). Likewise, Wagenseil observed that 20 of the 31 Chinese eunuchs had kyphosis of the spine (Fig. 5) (18). These observations appear to have been made before it was recognized that kyphosis is a manifestation of severe osteoporosis in women (40). In the Wagenseil study, men with kyphosis averaged 59 yr of age and had an average duration of castration of 42 yr, whereas the men who did not have kyphosis were slightly younger (average age, 54 yr) and had a slightly somewhat shorter average duration of castration (33 yr) (18). Involvement of the spine is common in men with osteoporosis of various etiologies (41), and in view of the fact that bone mineral density decreases progressively with time after castration, particularly in the first few years (42), it is surprising that kyphosis was not even more common in the Chinese eunuchs and the Skoptzy. Furthermore, an increased incidence of fractures does not appear to have been reported in the eunuchs, and Wagenseil had not observed kyphosis in his earlier study of eunuchs in Istanbul (33). The reason for the discrepancy between the Turkish study and the other studies is not clear. The Turkish eunuchs were

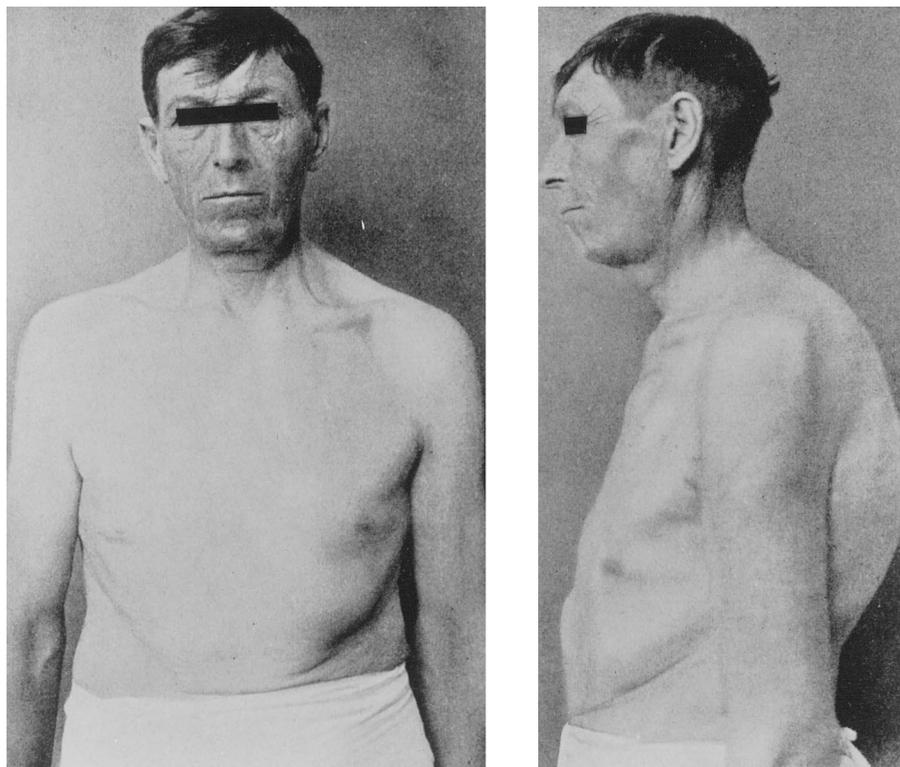


FIG. 4. Photograph demonstrating kyphosis in a 54-yr-old Skoptzy man who had been castrated at age 15 yr. Reprinted from Koch (13).



FIG. 5. Photograph demonstrating kyphosis and gynecomastia in eight Chinese eunuchs. The average age of these men was 56 yr, and the average time lapsed since castration was 38 yr. Reprinted from Wagenseil (19).

somewhat younger (average age, 44 yr), and were either Ethiopian or Sudanese in origin and might have had higher initial bone densities (43). Alternatively, osteomalacia due to vitamin D deficiency was common in Northern China in the early years of this century (44), and vitamin D deficiency might have contributed to osteopenia in the Chinese eunuchs (and possibly in the Skoptzy).

Gynecomastia. Hikmet and Regnault reported that the breasts in the Ottoman court eunuchs became large and pendulous (30). Although not commented on by either author, gynecomastia is also evident in 5 of 9 photographs of Skoptzy men

published by Koch (13) and in 7 of 14 photographs of Chinese eunuchs published by Wagenseil (19) (Fig. 5). Furthermore, Wu and Gu reported that 9 of the 26 subjects in their study had breast enlargement (25, 26). These observations of gynecomastia in castrated men are in keeping with the subsequent report by Heller, Nelson, and Roth that approximately half of men with functional prepubertal hypogonadism develop gynecomastia (45). In hypogonadal men, gynecomastia develops when estrogen formed by extraglandular aromatization of adrenal androgens is sufficient to cause breast enlargement in the face of profoundly low testosterone val-

ues (46). The reason that gynecomastia develops in some but not all men with primary hypogonadism is not known.

Apparent disappearance of the prostate. Androgen action is required for the development of the prostate gland during embryogenesis (47), and the prostate does not develop in men with mutations that profoundly impair the function of the androgen receptor (48) or of steroid 5 α -reductase-2 (49). Furthermore, it has been known since the 19th century that prostatic hyperplasia does not develop in prepubertal castrates and that castration causes regression of the hyperplastic prostate (50). Hikmet and Regnault reported that the prostate became atrophic in the Ottoman court eunuchs (30). Likewise, in Wagonseil's description of the autopsy of a 40-yr-old eunuch, the prostate gland was prepubertal in size (16 × 24 × 13 mm, corresponding to a weight of approximately 4 g) (33), a finding that is hardly surprising. However, the report by Wu and Gu that the prostate was completely impalpable in 21 of 26 Chinese eunuchs (and very small in the other 5) (25, 26) was unexpected and implies that viability of the gland throughout life requires the continued presence of gonadal hormones, presumably androgens. It is possible that very small prostates were missed on physical examination by Wu and Gu (25, 26).

Alternatively, it is possible that disappearance of the prostate is a function of time after castration, as the duration of castration in their study was much longer than that in any other report, recognizing that the duration of castration in the subset of men with barely palpable prostates (55 yr) did not differ from that of the group overall (54 yr).

Comment

Hopefully, it will never again be possible to repeat the studies reviewed in this paper, as in more recent times we have used different means of expressing man's inhumanity to man. It is to the credit of the pioneering physician scientists involved that useful medical information was obtained about the long term effects of castration, under circumstances that must have been difficult, from the study of these now extinct groups of castrated men, and it is impressive that all their findings (osteoporosis, failure of closure of the epiphyses, reactive pituitary hyperplasia, shrinkage of the prostate, and development of gynecomastia) have been confirmed subsequently by studies of individuals or small groups of individuals with various forms of hypogonadism.

One question of interest concerning castration in men cannot be resolved from the available data, namely the issue as to whether the life span of men is shorter than that of women because of the presence of testes or the absence of ovaries (and menstruation) (5). Indeed, there are no valid data indicating that castration has any effect on life span of men.

It is of some interest that no mention appears to have been made of the relation between castration and singing in any of the literature concerning the Chinese, Ottoman, or Skoptzy eunuchs, whereas there was a long tradition in Italy that associated the castrated state with phenomenal singing by men both in choirs and the opera (2). The probable reasons for this apparent discrepancy are several. First, the so-called castrati singers were, in fact, a heterogeneous group consisting of women who posed as castrated men, men with hy-

pogonadism and/or cryptorchidism, men with intact testes who probably sang as counter tenors or falsetto, and a few singers who either had their testes removed or crushed (51). Consequently, it is difficult to interpret the literature on the subject in medical terms. Second, in the instances in which castration was performed, only boys with extraordinary singing ability were chosen for such a procedure, and it is likely that singing ability would be no different in men selected for castration using other criteria than in the population at large.

Acknowledgments

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