The Influence of Sex on Anesthetic Morbidity and Mortality

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In a statistical analysis of personally conducted anesthetics for cholecystectomy and gastric resection during the five year period from 1944 through 1948, I studied the complications during anesthesia and in the postoperative period, and the mortality according to age, physical status, anesthetic agent and duration of anesthesia. The fact that all the deaths occurred in male patients prompted me to make a comparison of the behavior of the sexes. Table 1 shows some of the findings in the original paper.

In group A, cholecystectomies, women predominated with 69 per cent, and in group B, gastric resections, men predominated with 73 per cent. This sex distribution is in accordance with those of other observers. In the two operative groups there were no significant differences as to postoperative complications and mortality in the different age groups. The average physical status varied: in group A, the average for men was higher than for women, and in group B the opposite was observed.

If we look at the course of the anesthesia we find that whereas in female patients 65 per cent of the anesthetics were considered satisfactory in both types of operation only 46 and 50 per cent in the male patients were so. This was found despite the fact that men are considered to be more tolerant of drugs owing to their more vigorous constitution. In any case, in this series there was a significant sex difference in the frequency of complications during anesthesia.

As far as postoperative pulmonary complications are concerned the sexual difference is well known and is statistically quite evident. King found in his classical work in 1933 that the incidence of pulmonary complications among men was at least twice that in women. He designated as “poorer risks” men undergoing operation on the stomach, duodenum, gallbladder or intestinal tract owing to the consistently higher percentage of pulmonary complications in such cases. Brock reported similar findings. Holmes found, in an analysis of pulmonary complications in 2,064 consecutive surgical cases, that the majority of complications occurred in men. Perhaps the higher incidence of tobacco smoking by men is one explanation; another tenuous explanation is that in women respiration is predominantly costal in character so that an upper abdominal wound produces less reduction in respiratory exchange.

It is also well known that women who are more sensitive to morphine and its derivatives, which accounts for the finding of a higher incidence of postoperative vomiting and nausea among women. However, the more serious gastrointestinal complications were more frequent in men. Thus of the 13 cases in both series with paralytic ileus 11 were men, 5 of whom died of paralytic ileus. Among 12 cases with hiccough there was only one woman. The tendency to development of hiccough in male patients is also noticed during operation.

It seems, therefore, from this analysis that males are poorer risks in general, and are more liable to anesthetic and postoperative complications, a fact which seems not to have been generally recognized. However, an experienced surgeon, E. Perman, has said: “In routine surgical work it is quite remarkable how much more easily women endure major operations than men.”

It is a fact more and more recognized all over the world that the life span of man is shorter than that of women. Official Swedish statistics show that out of 200,000 live births equally distributed among males and females...
there were 15,000 more women alive at the age of 70 than men. In Sweden the mortality of women between the ages of 20 and 70 was the same both in rural districts and in small or larger towns. With the mortality of women averaging 100 per 100,000 of the population, the same figure was found for men in the rural districts, but was 120 in the smaller towns and in larger towns 130-146. Seemingly the more stressful the conditions of living, the greater the increase in mortality of men in the above mentioned age groups. Likewise, in the United States vital statistics show that the average life expectancy for women is five years longer than for men. Investigations by Johnstone and Hosker showed a higher mortality among males of all ages from pneumonia, bronchitis, appendicitis and peptic ulcer. They concluded that occupational differences must be an important factor in producing the disparity in male and female death rates.

The main cause of death in the male is circulatory disease, a fact well known. A statistical study of the causes of death in different age groups in Stockholm for 1951, showed that before the age of 65, 334 men but only 107 women died of heart disease. In the same year among men in the age group 55-60 arteriosclerotic and degenerative heart disease was the cause of death of 18.7 per cent in the rural districts and of 29.4 per cent in Stockholm. The same higher mortality of men in the younger ages was also found in the United States: the mortality for men in the age group between 15 and 74 being 50 per cent greater than for women. In recent decades the higher mortality in the male has increased considerably. In 1920 the mortality rate in the 45-54 age group was only 10 per cent higher than in women, whereas in 1950 it had increased to 78 per cent. The higher mortality is mainly the result of the increased frequency of circulatory disorders.

There is need for accurate statistical reporting on the sex distribution of the various diseases. Material of this nature is to be found in the annual reports from Swedish hospitals, which specify the sex and diagnosis of the cases admitted. Perman studied reports of the years from 1946-1948, from the medical departments of six large hospitals in Stockholm and eleven hospitals distributed throughout the country. The total number of cases was 60,000. Selections were made among those diseases which included the largest number of cases but excluding diseases of the urogenital organs, infections and tumors. Table 2 shows the results of this investigation. When the diagnosis is made on a medical ward, the data, from a diagnostic point of view, are far more reliable than the official statistics of the causes of death, which are largely based on death certificates issued outside hospitals.

In Table 2 it appears that the sex difference...
among the various disease groups is far greater than anticipated. Although it is well known that men, for example, are more frequently affected by myocardial infarcts and peptic ulcers, and women by gallstones and goiter, it is surprising that there are differences in almost each disease group. There must be sexual dissimilarities in the causes of disease of a biological nature rather than related to the gonads. The table also shows a greater preponderance of women in disease groups possibly associated with the endocrine organs. The greater and more varied activities of the endocrine systems in women may easily lead to functional disturbances. According to Pernan, this endocrine activity probably is the reason for women’s superior resistance to trauma and to operations of all types.

A summary of this statistical survey shows that the male predominance is seen only in the peptic ulcer and cardiac infarct groups. These are the two diseases in which longstanding stresses and strains are considered to be the chief etiological factors. With reference to autopsy reports showing a predominance of males in most diseases, it is very interesting to find a greater number of female patients treated for these diseases on medical wards, but with fewer deaths. To the extent that autopsy material is utilized for morbidity statistics, so will the preponderance of men increase. Since all of these diseases do not have a fatal outcome, the material gathered from medical wards provides a better idea of sexual distribution in morbidity.

From the above quoted vital statistics, special medical studies, and the anesthesiological experience it seems that there is a higher mortality rate in the male in all periods of life. This cannot easily be explained, as is commonly done, by reference to overwork, industrial hazards, abuse of alcohol and tobacco, for the difference in the sex mortality rate is found in intrauterine life as well as during the first few years of childhood. The higher mortality of males is thus not a peculiarity of the embryo, but is found in all age groups. Proportionally, more males than females die during each age period (fig. 1).

Why the male, at every age, is less resistant to death than the female is obviously not understood. Differences in behavior, habits and in the endocrine system have been discussed. Allen stated that “mere maleness influences unfavourably the resistance of the organism to disease at all ages.” Hamilton pointed out that the shorter life span of males characterizes most animal species so far investigated (42 species including nematodes, molluscs, birds, insects, and mammals). This demonstrates the error in assuming that differences in mode of life and habits are a factor in the differing longevity of males and females. Supported by experiments on animals and human castrates, Allen suggested that testicular hormones contribute to the lesser viability of males.

It is suggested that androgens, particularly those derived from the testes, contribute to the vulnerability of males, by an increase in the
rate of metabolism, which may also shorten the life span. In brief, Hamilton 11 says, a price is paid for a beard and the presence of functioning testes. There may be something to this, and possibly the greater vulnerability and higher mortality rate among males subjected to anesthesia and surgery is another aspect of this biological phenomenon.

The reason for the constitutional inferiority of the male may also be sought in the laws of heredity, but at present no satisfactory explanation is forthcoming. It has been suggested that the greater constitutional weakness of males may be due to the presence of only one X-chromosome. If X-chromosomes carry recessive alleles relating to lower viability, sub-lethality, or even lethality, then many hemizygous male zygotes would be subjected to the influence of these alleles, while most female zygotes would be heterozygous and not affected.9

The greater vulnerability and mortality in the male is therefore something to be considered in the indications for anesthesia and surgery. In past years a certain mortality was taken for granted. Nowadays, with modern methods and an overall steady decreasing mortality, we seek for specific causes in every fatal case, and an explanation for the variation in the incidence of complications.

References

HYPERTHYROIDISM Of 38 cases subjected to thyroidectomy, basic metabolism was over 115 per cent in 28 instances and 130 per cent or more in 16. Marked changes in cardiac function were noted after Fluothane anaesthesia in 50 per cent of those with a metabolic rate of more than 115 per cent and only 22 per cent after ether plus nitrous oxide anaesthesia. In addition, respiratory inhibition and hypotension occurred during Fluothane anaesthesia in the presence of hyperthyroidism. (Suzuki, S., and Kaneko, C. Fluothane Anaesthesia for Surgery of Hyperthyroidism (Japanese), J. Tokai Soc. Anaesth. 1: 55, 1962.)

BRONCHOSPIROMETRY Neuroleptanalgesia from dextro-moramid and chlorprothixen caused hypalgesia, psychic indifference and absence of coughing during bronchospirometry. Secretions were minimal. Patients cooperated well and showed retrograde amnesia. (Gemperle, M.: Bronchospirometry with Neuroleptanalgesia, Der Anaesthesist 12: 357 (Dec.) 1963.)