Turner Syndrome: Care Through the Ages

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Turner syndrome, the complete or partial absence of one of the X chromosomes, occurs approximately in 1:2,000 live born girls. Its most common signs and symptoms include short stature, gonadal dysgenesis, dysmorphic features with a wide range of disorders in multiple organ systems, especially the heart and lymphatic system.

The genetics include complete loss of one of the X chromosomes and deletions or malformations in the short or long arms of an X chromosome. These alterations result in marked phenotypic variability among individuals. It is the abnormal X chromosome that is preferentially inactivated and some may have Y chromosome material. The phenotypic variability seemingly shows that the blood karyotype may not be representative of the genetic make-up of other tissues.

In utero, the Turner genotype is approximately 99% lethal, and Turner syndrome is the leading individual cause of spontaneous first trimester pregnancy loss. This leads to the hypothesis that those fetuses with the 45,X karyotype who survive to term represent an "elite" with a critical mass of 46,XX cells necessary for survival. This may be designated occult mosaicism. The diagnosis of Turner syndrome may be made *in utero* based on nuchal translucency, cystic hygroma, or left-sided cardiac anomalies.

In childhood, there is growth failure, the characteristic phenotypic features and in the adolescent, these characteristics plus delayed or absent pubertal changes (1,2). The diagnosis is usually made from a peripheral blood karyotype, but 30 to 100 cells should be counted to discover low order mosaicism. Short stature and skeletal system anomalies are mainly due to the absence of the second *SHOX* gene on the pseudoautosomal portion of the X chromosome. In addition, there may be significant psychological and educational issues with specific challenges in visual-motor skills, visual-spatial skills, and working memory. As the girls reach adolescent age, the issue of pubertal induction becomes prominent. Proper low doses of estrogen permit the timing of puberty at the physiologic time.

One of the points of concern is at the transition from pediatric to adult care and another through adulthood give the multisystem health concerns. The medical care for the emerging adult should be based upon an agreed upon and structured transition plan to include: endocrine, cardiology, hearing and ENT, the issues of infertility and gynecology as well as the aforementioned psychology and perhaps psychiatry (3). Screening for osteoporosis, cardiovascular disease, hypertension, and the metabolic syndrome as well as psychology are important (4,5). The screening should also include celiac disease, hypothyroidism, and types 1 and 2 diabetes mellitus given that the relative risks for each exceed four-fold that of the general population.

Medical care should be directed toward any of the conditions found on screening or a more in-depth evaluation of those difficulties found on screening. Fertility and family planning remains major issues in many young adults. There are now a number of options using artificial reproductive technology, but pregnancy may be problematic.

In summary, one should make the diagnosis of Turner syndrome as soon as possible, employ rhGH therapy early, consider multiple medical and educational issues, induce puberty at the physiologic time, and have lifelong surveillance for multiple medical and psychological issues.

References

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