

## Recovery of spermatogenesis after testicle autotransplantation in an adult male\*

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There has been considerable controversy over what is the proper age at which to surgically bring cryptorchid testicles into the scrotum, and what chance these testicles have for normal spermatogenesis.<sup>1</sup>

It has been very difficult to answer these questions, because 15- to 25-year follow-up of children operated on for intraabdominal, or cryptorchid, testicles is not readily available. However, an answer could be obtained in a few instances by operating on young adults whose intraabdominal testicles had never been treated in childhood. Such cases could tell us fairly quickly whether the delay of bilateral orchidopexy until after puberty would irrevocably destroy any chance of fertility.

We now have 16 months' follow-up on a young man with bilateral intraabdominal testicles who underwent bilateral testicular autotransplantation to the scrotum at 18 years of age. This case demonstrates the potential regenerative ability of the high intraabdominal testicle to recover normal spermatogenesis even when transferred to the scrotum long after puberty has been completed.

### CASE REPORT

An 18-year-old boy who was about to enter college was referred to us because of "absent testi-

cles" since birth. He had undergone groin exploration in early childhood, and "no testicles were found." However, at age 12 he began to go through puberty in a normal fashion, and by the time he was referred to us he was a normally masculinized pre-college male. He had no testicles in either scrotal sac, and semen analysis consistently revealed zero sperm. His serum follicle-stimulating hormone (FSH) level was markedly elevated at 43 mIU/ml (normal range, 3 to 17 mIU/ml). His luteinizing hormone (LH) level was in a high normal range of 24.8 mIU/ml (normal range, 6 to 30 mIU/ml), and his serum testosterone level was 650 ng/100 ml (normal). Several semen analyses were checked repeatedly, and there were no identifiable sperm on centrifuged samples.

We performed an intraabdominal exploration and a bilateral testicle autotransplant on this young man by the technique we have previously described (Fig. 1).<sup>1</sup> At the time of surgery a testicle biopsy was performed on each testicle (Fig. 2), which showed absence of mature spermatids, and a moderate number of spermatocytes, and spermatogonia with many areas of Sertoli cells only. The Leydig cells were unremarkable, as is usually the case in young adults with cryptorchid testes.

### RESULTS

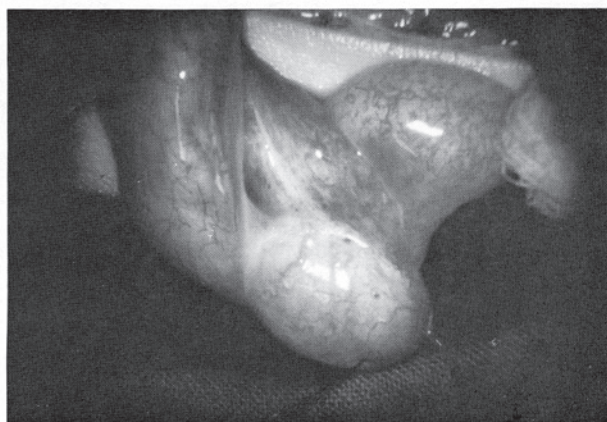
The patient's postoperative course was unremarkable. Repeated Doppler readings and scrotal scans indicated excellent blood supply to both testicles, and they remained well positioned in the bottom of the scrotal sac on each side. The patient's serum hormones and semen analyses were followed regularly until the time of this writing,

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**Figure 1**  
After division of the testicular vessels the testicle can be lifted out of the abdomen and placed into the scrotum.

which is 16 months after the operation (Table 1). Two months postoperatively the patient remained azoospermic, and his serum FSH remained markedly elevated. At 5 months he still had no sperm in the semen. However, by 8 months his serum FSH level had come down to a high normal range, and there was occasional, normal motile sperm found in his ejaculate. By 13 months postoperatively his serum FSH had come down well into the normal range, and his sperm count was 3,000,000/ml with excellent 90% grade 3 progressive motility. By 16 months postoperatively he had 15,000,000 sperm/ml (volume 3 ml). There was 90% excellent motility of grade 3 and 4 quality with rapid forward progression. He had greater than 70% normal forms. Thus, by 16 months postoperatively this patient had a normal semen analysis.

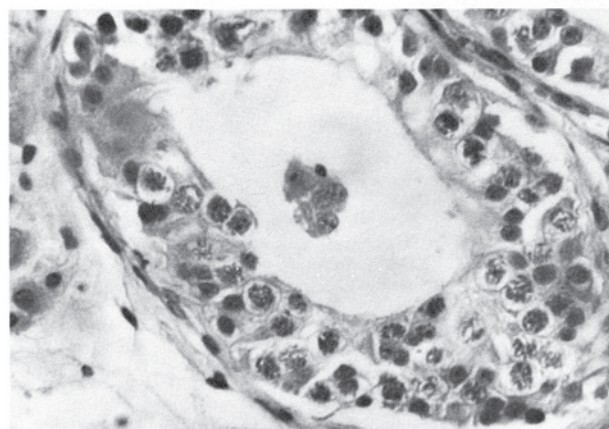
## DISCUSSION

A major unanswered question in the field of cryptorchidism is whether transplantation of these testes to the scrotum will allow the ultimate development of fertility when the children grow up. There is strong experimental evidence in animals suggesting that when a normal testicle is placed in the abdomen it ceases to produce sperm, and when taken out of the abdomen and placed back into the scrotum sperm production resumes.<sup>2, 3</sup> However, clinical information on cryptorchidism in man is understandably speculative and circumstantial.<sup>4-6</sup> All of the recommendations regarding at what age it is best to perform orchidopexy in a child are based only on circumstantial evidence drawn from histologic

examination of prepubertal testicles. Some clinicians maintain that if a cryptorchid testicle is not brought into the scrotum by 2 years of life there will be permanent damage to spermatogenesis, and if it is not brought down by puberty the chances for spermatogenesis are nil.<sup>4, 6</sup> Some maintain that cryptorchid testicles are inherently defective, and therefore orchidopexy at any age will do nothing to restore the fertility of that testicle.<sup>5</sup> However, the mere presence of electron-microscopic changes in cryptorchid testicles as early as 2 years of life is no reason to conclude that such testicles would never be capable of normal spermatogenesis if brought into the scrotum later in life.

There are only two other reported cases of post-pubertal males with bilateral cryptorchidism undergoing orchidopexy.<sup>7, 8</sup> In both of these cases the testicles were not intraabdominal. Nonetheless, these reports suggested the possibility that fertility could perhaps be salvageable even in adults whose cryptorchidism had never been treated at the recommended age.

In the case we now present, there seemed to be very little hope for fertility. The testicles were intraabdominal and required the most difficult type of orchidopexy, i.e., testicular autotransplantation. In addition, the patient was 18 years old before his testicles were brought down. His serum FSH level was markedly elevated, and his testicle biopsy showed absolutely no sperm production. Yet after transplanting these testicles from the warm environment of the abdomen to the cooler environment of the scrotum (without compromising the blood supply), the FSH came down to



**Figure 2**  
The testicle biopsy shows no spermatozoa or spermatids, but there are a modest number of spermatocytes and spermatogonia.



**Table 1.** *Postoperative Values*

	Preoper- ative	2 Months	5 Months	8 Months	11 Months	13 Months	16 Months
FSH (mIU/ml) (3–17)	43	39		18		15	
LH (mIU/ml) (6–30)	24.8	21		18		19	
Testosterone (ng/100 ml) (300–800)	650	731	610		664		
Sperm count	0	0	0	100,000/ml Occasional mo- tile sperm	3,000,000/ml 3 ml volume 90% excellent grade 3 mo- tility 90% normal forms	3,000,000/ml 2.5 ml volume 90% excellent grade 3 mo- tility 90% normal forms	15,000,000/ml 3 ml volume 90% superb grade 3 and 4 motility 90% normal forms

normal levels, and by 16 months postoperatively, the patient had an excellent sperm count with good sperm motility and morphology.

Such cases are very difficult to find and certainly do not represent a large series. Therefore, no universal conclusions can be reached from this case or the previous two similar cases in the literature; but careful study of such patients supports some crucial implications for the problem of human cryptorchidism.

Cryptorchid testicles do not produce sperm postpubertally if they are not brought into the scrotum. Bringing cryptorchid testicles into the scrotum can salvage spermatogenesis. Even a severely high intraabdominal cryptorchid testicle may possibly develop spermatogenesis if properly operated upon. A nondamaging surgical technique that preserves the blood supply to the testicle may be important. The damage to spermatogenesis caused by neglecting to bring down a cryptorchid testicle early in life may possibly be reversible when the testicle is eventually brought down later.

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