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Percutaneous Epididymal Sperm Aspiration in a man with Congenital Bilateral Absence of the Vas Deferens undergoing an Assisted Reproduction Program

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ABSTRACT

Surgical retrieval of spermatozoa for in-vitro fertilisation (IVF) programs for severely oligospermic men has been in use for several years now. In the recent 2 to 3 years, clinicians have begun to move towards non-surgical methods of retrieving sperm in certain selected groups of men. Percutaneous epididymal sperm aspiration (PESA) has had good results in terms of number of sperm obtained, as well as the fertilisation and pregnancy rates. The first reported use of such a technique in Singapore is described.

Keywords: percutaneous, sperm aspiration, absent vas, azoospermia.

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INTRODUCTION

Prior to the days of sub-zonal or intracytoplasmic sperm injection (SUZI / ICSI), severely oligospermic men could only resort to donor semen inseminations for their partners in order to have children. With the advent of ICSI, only a handful of spermatozoa are required for injection in an IVF cycle. However, in men with obstructive azoospermia, surgical retrieval of spermatozoa is still necessary prior to ICSI. This has traditionally been performed via microsurgical epididymal sperm aspiration (MESA) or testicular sperm extraction (TESE)[1]. Both procedures require general anaesthesia, surgical incisions and a hospital stay of 1 to 2 days.

Percutaneous epididymal sperm aspiration (PESA) involves only local anaesthesia, skin punctures, and the procedure can be performed as day surgery. The advantages of such a technique are obvious. The authors report a case performed in a tertiary referral IVF unit in Singapore, which is believed to be the first locally reported case.

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CLINICAL HISTORY

The patient was a 35-year-old man diagnosed to have congenital bilateral absence of vas deferens (CBAVD) after he presented with a 2-year history of primary subfertility. Clinical examination revealed normal-sized testes, distended epididymis bilaterally and no palpable vas deferens on both sides. Serum investigations revealed normal levels of follicular stimulating hormone (8.6 IU/l), luteinising hormone (4.1 IU/l) and testosterone (13.5 nmol/I). Karyotyping revealed a normal 46 XY male karyotype.

The couple's first cycle of IVF-ICSI was performed in 1996, and the patient underwent MESA on his right epididymis. The samples collected showed a sperm density of 6.7 million/ml, 14% of which were progressively motile sperms. The detailed sperm parameters are given in Table I. The ICSI program produced 11 fertilised oocytes which were transferred back to his wife over 3 transfer cycles; unfortunately, no pregnancies resulted.

The couple returned for another cycle of ICSI, and this time they were counselled for both MESA and PESA. Although they opted for PESA, they were also advised that the procedure would be performed in the operating theatre so as to facilitate MESA in the event that PESA failed to retrieve adequate spermatozoa.

SURGICAL TECHNIQUE

The patient was shaved and put in supine position. After cleansing of the groin region with cetrimide and chlorhexidine solutions, the scrotum was draped as for a MESA procedure. Local anaesthetic consisting of a 50-50 mixture of 1% lignocaine and 0.5% marcaine was mixed in a 20 ml syringe fitted with a 21 gauge needle. At the neck of the scrotum, the left spermatic cord was located and held under the skin by the left thumb and index finger. A small bleb of anaesthetic was injected into the scrotal skin just above the fingers. The needle was advanced deeper to infiltrate medially and laterally around the spermatic cord then repositioned to pierce and infiltrate the cord itself. The needle was then relocated subcutaneously to infiltrate the anterior scrotal skin just above the caput epididymis[2].

At this stage the patient was still rather anxious and 3 mg of midazolam and 1 microgram of morphine were given intravenously for sedation.

After ensuring that the skin and epididymis were adequately anaesthetised, the cauda epididymis was held between the left thumb and left index finger. A 23 gauge butterfly needle was held between the right thumb and index finger, and was inserted into the most distended portion of the epididymis. An assistant then attached a 20 ml syringe to the distal end of the butterfly tubing and created a 10 to 15 ml vacuum suction in the syringe. This suction was maintained while the needle was moved slightly in and out, and the epididymis gently squeezed with the left hand.

The first two punctures performed on the cauda epididymis were dry punctures, despite being the more distended portion of the epididymis. A third puncture was then made in the caput epididymis, using the same technique described above. A small droplet of slightly cloudy fluid was obtained; an artery forceps was immediately used to clamp the tubing close to the syringe end, and the needle removed from the epididymis without releasing the vacuum suction. The syringe was then removed, and the butterfly tubing and artery forceps handed over to an IVF scientist for immediate microscopic examination. Meanwhile a fourth puncture was made in the caput epididymis in an attempt to obtain more epididymal fluid.

Direct pressure was applied to the puncture sites after the procedure for about 2 to 3 minutes. Opsite™ dressing was sprayed onto the puncture sites, and the patient was sent back to the ward with a truss to ensure continuous pressure on the puncture sites for a few more hours.

RESULTS

Local anaesthesia provided good pain relief, and no further anaesthetic was required.

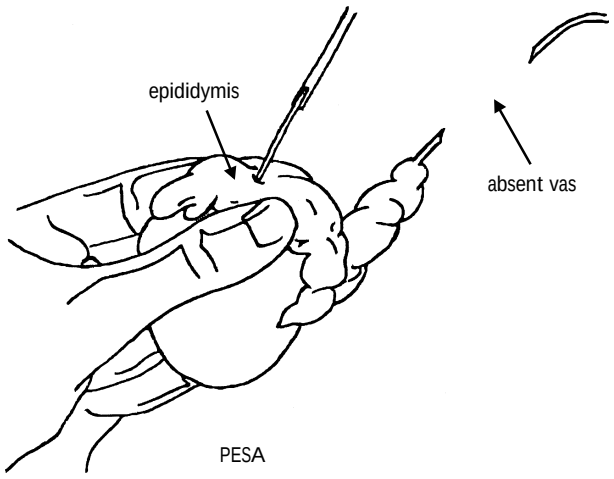
A total of 4 percutaneous punctures were made. The first 2 were made in the clinically distended cauda epididymis, but no sperms were found. The third puncture performed in the caput epididymis, obtained 0.1 ml of fluid which revealed viable spermatozoa with a density of 5.8 million/ml, of which 37% of them were progressively motile. The detailed analysis is reported in Table I.

The fourth puncture was unfortunately blood-stained, making analysis of the semen droplet difficult. In addition, some of the blood clotted in the butterfly tubing trapping spermatozoa within the clot. This sample was discarded.

There was minimal pain throughout the procedure, nor was there any significant haemorrhage or tissue trauma. There was no intra-procedural complication that required open surgery for repair or haemostasis. The entire procedure lasted 30 minutes.

Table I. Semen Parameters of MESA and PESA Specimens

Parameter	MESA	PESA	Normal
Sperm Density (x 10^6 per ml)	6.7	5.8	10-120
Motility (%)	14	37	40-100
Morphology (% normal)	5	2	>30
Round Cells (x10^6 per ml)	0	0	<1



The patient rested for 6 hours after the procedure because of the intravenous sedation that was given. He did not complain of excessive pain or discomfort, and was ambulant within 2 hours. There was only mild bruising of the scrotal skin from the needle punctures, but no haematoma. He was discharged after 6 hours with oral mefenamic acid.

Ten oocytes were retrieved from the patient's wife, and all were injected with the freshly retrieved epididymal sperm. Fertilisation was achieved in all oocytes (100%), and 3 fertilised oocytes were transferred on day 3. These were grade 1, grade 2 and grade 3 embryos respectively. Of the remaining 7 embryos, 3 were disposed of due to developmental arrest, and 4 were frozen and stored for future replacement.

There was sufficient sperm remaining for storage as well. These were frozen in 4 vials, each with an average volume of 0.25 ml and an average density of 3 million sperms per millilitre, for future ICSI cycles.

A urine pregnancy test performed 2 weeks later was unfortunately negative.

DISCUSSION

PESA is undoubtedly superior to open surgery in terms of technical ease as well as surgical and anaesthetic risk. From the patient's point of view, a simple day-surgery procedure under local anaesthesia has many attractive features too. However, it is important to emphasize to the patient during the counselling phase that PESA

procedures may not be successful in obtaining spermatozoa, and that MESA or even TESE under general anaesthesia may be necessary. Hence all patients should be prepared as for open surgery, for example, pre-operative investigations, fasting the night before, pubic hair shaving if necessary. PESA may be performed in the clinic setting, but the authors would recommend performing the procedure in an operating theatre setting in view of the possibility of need for open surgery. In addition, anxious patients may require intravenous sedation to calm them down[3,4]. These sedative agents have been reported to cause respiratory and cardiac depression[5,6], and the normal consultation room setup may not be equipped to handle such situations. Furthermore, manipulation of the testes can occasionally result in vaso-vagal reflexes that may require treatment with intravenous atropine[3] and close cardiovascular monitoring, all of which would be better undertaken in the operating theatre.

The apparent ease with which PESA can be carried out should not blind the surgeon from the potential pitfalls associated with this procedure. PESA should be performed in patients with obstructive azoospermia where reanastomosis of the vas deferens is not a viable option, for example, congenital absence of the vas, failed reversal after vasectomy, or where both partners prefer to undergo assisted conception[2]. Obstructions of the vas deferens due to previous infection or vasectomy should be treated by microsurgical reanastomosis first, before resorting to PESA or MESA[7]. These latter procedures may result in scarring of the epididymis, causing permanent obstruction to the testicular outflow tract and alter the reproductive future of these patients. On the other hand, workers like Lisek[4], Collins et al[8] and Levine[9] have reported successful spermatozoa retrievals during second and even third PESA attempts with no apparent complications. Opinion is still divided as to the true clinical risks of epididymal scarring and obstruction after PESA procedures, and data is as yet insufficient on this very new surgical technique.

The site of epididymal puncture should be the site of maximal distension. For most patients, this is usually the region just proximal to the site of obstruction. In about 4% of patients, careful palpation of the vas deferens would reveal a small spermatocoele[2]. This normally contains a small amount of fluid which on percutaneous aspiration would give a good yield of motile spermatozoa[10] sufficient for most lCSI cycles, and perhaps even for freezing and storage. In the other 96% of patients, the most distended portion of the epididymis should be aspirated first. In any event, the surgeon should re-insert the butterfly needle more proximally if the first 1 to 2 aspirates prove to be azoospermia. Most authors advocate a total of 3 to 4 epididymal punctures on each side, after which the other options of MESA, TESE or even testicular sperm aspiration (performed using the same butterfly needle) should be considered[11,12].

Spermatoza obtained from the epididymis as been shown in numerous papers to be of comparable quality[13], and results in similar fertilization and clinical pregnancy rates[14,15] as spermatoza from ejaculates. Most published studies to date have shown that PESA procedures provide adequate numbers of spermatozoa for at least one ICSI cycle, provided that motile sperms were positively identified. In one paper, researchers from China claimed to have obtained sufficient spermatozoa from PESA to perform intra-uterine insemination (IUI) on several of their patients, one of whom actually conceived[16]. This success, however, has not been replicated elsewhere, and would not be easily reproduced either. The average number of spermatozoa required for an IUI pregnancy to occur is approximately 5 million. PESA yields only a small droplet of fluid in the tubing of the butterfly needle, and is unlikely to come close to containing the large number of sperm needed for IUI. Most published data on PESA procedures, however, report a sufficient yield of spermatozoa for the current ICSI cycle as well as storage for future cycles[9,17]. The authors have found it useful to have an IVF scientist or embryologist present in the operating theatre at the time of PESA, so that each aspirate can be examined immediately for motile spermatozoa, and an estimate of the number made. The procedure can then be stopped once sufficient sperm is obtained, and further epididymal trauma avoided.

PESA is almost always performed as an out-patient procedure in most centres, given the nature of the surgery. The duration of post-operative observation varies, depending on the amount of intravenous sedation used, and the level of discomfort felt by the patient. In most instances, the patient is discharged after 1 to 2 hours, and oral analgesics would suffice. Patients would have mild scrotal bruising present for several days, but significant scrotal haematoma or bleeding is very rare[11]. Complications requiring re-hospitalisation or exploratory surgery have not been reported in the larger series by Levine and Lisek[9] or Tsirigotis et al[15].

CONCLUSIONS

The trend in gynaecologic surgery today is towards minimally invasive procedures performed under local or no anaesthesia. Hysteroscopy and laparoscopy are good examples of such “office procedures” and the same can be said of gamete retrieval techniques for assisted reproduction. Needle aspirations of epididymis and testes to obtain spermatozoa for ICSI are now reported in an increasing number of centres around

the world, bringing a new dimension to the management of the near-azoospermic man. If therapeutic indications are kept in proper perspective, then the field of assisted reproduction certainly looks exciting in the forthcoming years.

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