Cryocauterization of the vas deferens

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Summary: An isolated segment of the vas deferens 2–3 cm long was cauterized using cryotherapy in 10 acceptors of voluntary sterilization to determine whether this method could be successfully employed as an alternative to vasoligation and resection. Three months postoperatively 8 patients were azoospermic but 2 patients were oligospermic. Due to the high failure rate this method cannot be recommended as a routine procedure.

Introduction
Various techniques have been employed to occlude the human vas deferens. It has been ligated, ligated and resected, sclerosed (Freeman 1975), electrofulgurated (Moss 1976), fulgurated and fascia interposed (Schmidt 1973), irrigated with chemicals (Albert & Seebode 1978), occluded with tantalum clips (Gupta et al. 1977), had valves inserted into it (Brueschke et al. 1975), and been plugged with intravasal threads (Lee 1969). All these methods have their advantages and drawbacks, but throughout the world vasectomy as it is routinely performed involves ligation and resection of a small segment of vas deferens.

It has been known for a long time that the application of intense cold to tissues causes necrosis of cells (Arnott 1851), and the therapeutic application of extreme cold to biological systems (Cooper 1962) gave birth to cryogenic surgery. Cryosurgery provides a method of producing a consistent and complete destruction of cells, without inflammation and resultant fibrosis and without the distortion of anatomical architecture. Cryosurgery has been successfully employed in the treatment of malignant neoplasms of the rectum (Osborne et al. 1978), uterine cervix (Elmfors & Stormby 1979) and prostate (Soanes & Gonder 1968). It has been used in the destruction of benign neoplasms (Gongloff et al. 1980) and in the treatment of haemorrhoids (Rudd 1978).

The accidental occlusion of ducts following cryosurgery has been reported: for example, the lacrimal duct (Matthaus 1977, Fraunfelder et al. 1980), cervical canal (Thormann & Schantz 1980), urethra (Gonder et al. 1966) and bladder neck (Yantorno et al. 1967). Unsuccessful attempts have been made to occlude the fallopian tubes by a transuterine approach (Cahan & Brockenier 1967, Martens 1969, Hulka & Omran 1971).

As there is no reference in the available literature regarding the use of cryosurgery to occlude the vas deferens, a study was undertaken to explore the potential of cryocauterization of the vas deferens as a sterilization technique.

Methods
Cryocauterization of the vas deferens was carried out on 10 acceptors who had at least two living children each and who had consented for voluntary sterilization. The irreversibility of the operation and also its possible failure was clearly explained to each acceptor and his wife and written consent was obtained from both. The acceptor was assured that in the event of failure a conventional vasoligation and resection would be performed.

The initial steps of the operation were the same as for a routine vasectomy. Local anaesthesia was achieved using 3 cm$^3$ of 1% lignocaine; a single midline incision was made and the vas delivered through it. The sheath of the vas was incised and a loop of vas together with its mesentery was pulled out with vas forceps. By blunt dissection with an artery forceps

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the mesentery of the vas was gently stripped from the vas over a distance of about 2 cm, and the two ends of the isolated vas were crushed with an artery forceps as in routine vasectomy. The crushing forceps were removed and the entire isolated loop was cauterized using a 2.5 mm cryoprobe (Amoils cryounit ACU 12), with nitrous oxide as the cryogen. Two freeze-thaw cycles of 2 minutes each were applied to each point on the vas and the temperature attained was -70°C. On average, the vas was cauterized at 4–6 coadjacent points. The upper edge of the mesentery of the vas was also cauterized and the cryoprobe was applied to any fascial bleeding points. Thus a 2 cm segment of vas was cryocauterized and rendered totally avascular throughout its length. The vas was not resected nor ligated and was gently replaced in the scrotum. The identical procedure was carried out on the opposite vas. A single suture was applied and the skin incision closed with a sterile dressing.

The acceptor was advised not to have intercourse without using condoms, and an adequate number of condoms were issued. The patients were requested to return on the fifth postoperative day and were followed up at monthly intervals thereafter. A sperm count was done at the end of the third month.

Results
By the fifth postoperative day all wounds had healed. There were no cases of bleeding, scrotal swelling or haematoma. All patients reported that they had no postoperative pain and were certified fit for all duties. A sperm count done 3 months postoperatively showed live and motile sperm (<50 000/ml) in two of the specimens, though the remainder were azoospermic (Table 1).

Discussion
Conventional vasoligation and resection involves the complications of haemorrhage, retention of foreign bodies in the form of non-absorbable suture materials, persistence of palpable nodules at the cut ends of the vas, and difficulty in reanastomosis should this be required at a future date.

The attempt at cryo-occlusion of the vas, though taking longer than a normal vasectomy, caused no pain or discomfort to the patient for sensory nerves were inactivated by the cryolesion (Barnard 1980). Bleeding was absent as cryocauterization was both haemostatic and vaso-occlusive, and the necessity for resecting the vas was eliminated. As it was a sutureless technique, no foreign bodies were left behind.

Though pan-necrosis of cells occurs after cryosurgery, regeneration is known to occur with good recovery of function within a few weeks (Beazley et al. 1974) and the persistence of live sperm in the seminal fluid probably indicates the occurrence of recanalization. But this is difficult to understand because cryocauterization attains the same goal as fulguration, which

<table>
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<tr>
<th>Patient</th>
<th>Age (years)</th>
<th>No. of children</th>
<th>Seminal fluid volume (ml)</th>
<th>Sperm count/ml</th>
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<td>Before vasectomy</td>
<td>After vasectomy</td>
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<td>1</td>
<td>36</td>
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<td>1.8</td>
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<td>37</td>
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<td>10</td>
<td>31</td>
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has been shown by Schmidt (1966) to prevent recanalization, and clinically no sperm granulomas were detected in any of the patients.

Another explanation may be that the occlusion of the vas is temporary and is caused by plugging of the lumen with necrotic and sloughing material, as has been shown to occur in the urethra after cryotherapy to the prostate (Gonder et al. 1966). As spontaneous re-epithelialization is a constant threat, a further follow up of the azoospermic patients is planned to determine the permanency of the operation, but because of the already high failure rate cryocauterization cannot be recommended as a routine procedure.

The other disadvantage of cryosurgery to the vas which must be considered is the possible occurrence of a cryoimmune response (Li et al. 1977) which could be detrimental to the success of a future vasovasostomy.

Taking all these factors into consideration, it is doubtful if a permanent cryogenic blockade of the vas deferens could be achieved.

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