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Postoperative analgesia for day-case herniorrhaphy patients

A comparison of cryoanalgesia, paravertebral blockade and oral analgesia

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Summary

Patients were admitted as day-cases for inguinal herniorrhaphy under epidural anaesthesia and chlormethiazole sedation. The patients were given oral analgesia, and in addition, some were given either a paravertebral block with a dextran/bupivacaine mixture or cryoanalgesia of the ilio-inguinal nerve for postoperative pain relief. These anaesthetic and analgesic techniques are discussed in relation to day-case herniorrhaphy.

Key words

Analgesia; postoperative.
Anaesthetic techniques; paravertebral, cryoanalgesia.
Anaesthesia; outpatient.

Day-case and short-stay herniorrhaphy is not a new concept[1 7], but in the United Kingdom it has yet to attain widespread popularity. From the economic point of view[8] a hospital bed is occupied for a few hours instead of a week, but this is a false economy if the saving in the hospital is accompanied by increasing demands on the GP or district nurse, or if the patient receives inferior treatment. However, the clinical outcome of day-case or short-stay herniorrhaphy patients has been compared favourably with those treated on a conventional inpatient basis,[9–11] and many of the patients requiring herniorrhaphy are relatively young, and prefer being cared for in their home surroundings.[12]

Inguinal herniorrhaphy is not a quick operation, and if the patient is given general anaesthesia, there may be a prolonged recovery phase. Local anaesthesia by infiltration is often uncomfortable for the hernia patient,[7] a large dose of anaesthetic drug may be required, and this technique is often supplemented with heavy premedication or sedation, using drugs with slow elimination. Therefore, it was decided to use a regional anaesthetic technique which is less unpleasant for the patient and which gives complete anaesthesia

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of the operation site and, hence, good operating conditions. In addition the patients were sedated with a chlormethiazole infusion.[13,14]

One possible problem with day-case herniorrhaphy is postoperative pain, although this problem had received little attention in previous work. A cryoanalgesic technique has been developed which appears to block the conduction of pain from the abdominal muscle for several weeks, without affecting cutaneous sensation, and in the cases presented in this communication we have compared this cryoanalgesia with conventional methods of postoperative analgesia, oral analgesia and long-duration local anaesthetic blockade.

Methods

Patients presenting in the surgical out-patient department and found to require non-recurrent herniorrhaphy were considered for day-case surgery. The patients, provided they were generally fit and had a competent person at home to care for them, were offered the choice of day-case admission using regional anaesthesia, or inpatient admission usually using general anaesthesia. Details of the patients in this series are given in Table 1.

The starved patient was admitted 30 minutes pre-operatively. An 18 gauge Venflon iv cannula was inserted in a suitable large arm vein. The patient was turned into the lateral position, and if sedation was thought to be necessary, a bolus of 50 ml of 0·8% chlormethiazole (Heminevrin, Astra) solution was injected via the cannula over 30 seconds. A Tuohy needle was then inserted in the midline at L2/3 and 15–20 ml of either 1·5% lignocaine or 0·5% bupivacaine, without adrenaline, injected into the epidural space. The patient was transferred to the operating theatre and chlormethiazole was continued as an infusion, which was adjusted so that the patient slept lightly throughout the operation, the rate being gradually reduced.

A cryoprobe tip with a broad hook, attached to the Spembly Amoils PCG series cryosystem, was immersed in chlorhexidine in spirit for at least 30 minutes. Prior to use the probe was removed from the solution and cooled to approximately −60°C and then allowed to rewarm. A third of the patients were selected randomly for cryoanalgesia.[15] After the herniotomy and the repair of the internal inguinal ring and posterior wall of the inguinal canal, the internal oblique muscle was closed and the ilio-inguinal nerve, on the surface of this muscle, was identified and at least 5 cm mobilised. The nerve was elevated by the surgeon, and then held by the anaesthetist in the hook of the cryoprobe tip whilst it was frozen for two periods of 1 minute, a period of 30 seconds being interposed to allow thawing.[16] Rotation of the tip then released the nerve from the hook, and the remaining layers were closed.

When the operation had been completed, half of the patients who did not receive cryoanalgesia were turned into the lateral position and a mixture of 10 ml of 0·75% bupivacaine and 10 ml

Table 1. Details of the patients in each analgesic group

	Cryoanalgesia	Paravertebral blockade	Oral analgesia
Number of patients	10	10	10
Age (years)*	51·2 (6·7)	47·8 (7·5)	51·3 (5·6)
Hernia			
left	6	7	6
right	3	3	4
bilateral	1	0	0
Smokers	4/10	3/10	3/10
Hypertensives	1/10	2/10	0/10
Local anaesthetic			
Lignocaine	4	6	5
Bupivacaine	6	4	5
Male/female	9/1	9/1	9/1
Additional procedures	Cord lipoma (1) Hydrocoele (1)	—	Cord lipoma (1)

* Mean (and SD).

of 6% dextran 70 in saline were injected into the ipsilateral paravertebral space at the T12 level, using the medial approach for a somatic paravertebral block as described by Shaw.[17]

The patient was then returned to the ward to rest, until seen by the anaesthetist 1–2 hours postoperatively. The patients were given dextropropoxyphene/paracetamol (Distalgesic) tablets for postoperative analgesia, and the patients who were not given cryoanalgesia were given six 50 mg pethidine tablets as well. The patient was told to expect some discomfort in the postoperative period but to use the oral analgesia if the pain was severe, and asked to record the times and doses of oral analgesia required. Rapid mobilisation was encouraged, but lifting and strenuous exercise were prohibited for at least 4 weeks. The patient was discharged from the hospital 6–8 hours after admission, if both the patient and nursing staff agreed that this was appropriate, although facilities were always available for inpatient admission if required.

The General Practitioner was informed of the patient's operation by the surgeon by telephone. The patient was seen again 4 days postoperatively by the anaesthetist. The wound was examined, and a comprehensive history taken of the patient's pain, activity, and problems in the postoperative period. The record of oral analgesia requirements was examined and cross-checked against the number of tablets remaining. The patients were seen 1 month postoperatively by the surgeons, and after 2 months they were sent questionaires about postoperative problems, pain and their reactions and opinion of the operation as a day-case procedure.

Results

Details of the patients and their operations are shown in Table 1. The three groups, receiving different forms of postoperative analgesia, were not significantly different in personal or operative details.

Student's *t*-test was used to determine statistical significance where appropriate, otherwise the Wilcoxon test was applied.

The postoperative analgesia requirements of the groups of patients are detailed in Table 2. During the 4 days following the operation, the cryoanalgesia group required significantly ($p < 0.01$) fewer Distalgesic tablets than the paravertebral group, and the latter required significantly ($p < 0.05$) fewer than the group receiving only oral analgesia. There was no difference in pethidine requirements between the paravertebral and the oral analgesia groups. The daily analgesia requirements for the three groups are shown in Fig. 1. For each of the postoperative 4 days, the cryoanalgesia group required less analgesia each day than the paravertebral group, who in turn required less than the oral group. During the first day the groups were significantly different. During the second and third days the cryoanalgesia group required significantly ($p < 0.01$) fewer tablets then the other groups, there was no significant difference between the paravertebral and oral analgesia groups. On the fourth day there was no difference between the cryoanalgesia and paravertebral groups, but they

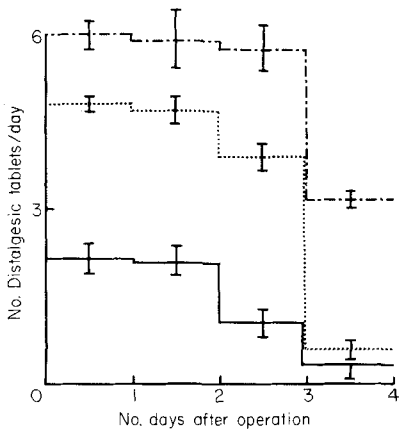

Fig. 1. Daily requirements of supplementary analgesia —— Cryoanalgesia; ···· Paravertebral; ·–·– oral analgesia.

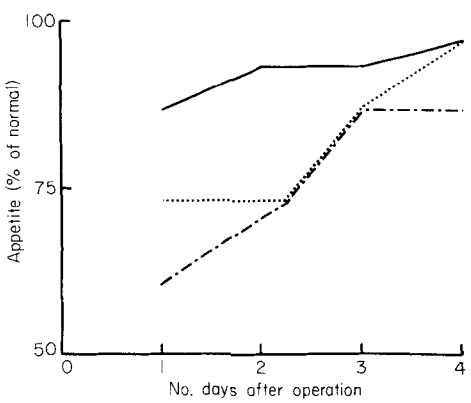

Fig. 2. Postoperative changes in appetite —— Cryoanalgesia; ···· paravertebral; ·–·– oral analgesia.

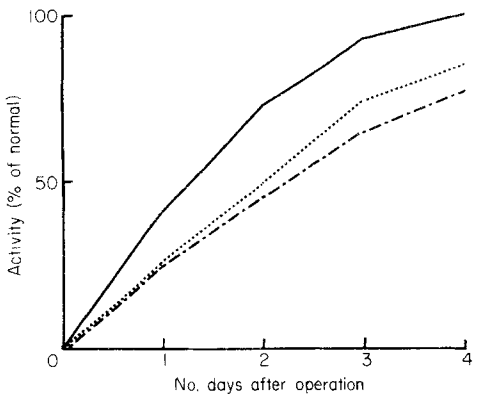

Fig. 3. Postoperative changes in activity —·— Cryoanalgesia; · · · · paravertebral; · – · · oral analgesia.

required significantly ($p < 0.01$) fewer tablets then the oral analgesia group.

The recovery and activity during the immediate postoperative period are shown in Figs 2 and 3. Various milestones in the recovery of normal activity are detailed in Table 3. There was no difference between the groups in the time taken to start driving a car again or climbing stairs. The cryoanalgesia group resumed normal activity significantly ($p < 0.05$) earlier than the oral analgesia group, but the value for the paravertebral group was intermediate in value and not significantly different from the other groups. The cryoanalgesia group also said that they felt fit to return to work significantly ($p < 0.05$) earlier than the other groups, but there was no difference between the paravertebral and oral analgesia groups. There was no difference between the actual time that the groups returned to work.

Of the ten patients allocated to the cryoanalgesia group, only eight patients were found to have an ilio-inguinal nerve which could be cryoblocked. In Tables 2 and 3, these eight patients are presented in a separate group as well, so that evaluation of the technique of cryoblockade can be made, in addition to assessment of the method for which details of all ten patients in the group are given.

Discussion

The patients were sedated if necessary with a bolus injection of chlormethiazole before the epidural anaesthetic, followed by an infusion during the operation. Chlormethiazole is derived from vitamin B_1 and has hypnotic, sedative, amnesic and anti-emetic properties. It is available as a 0·8% concentration in glucose solution. It has no analgesic effects, and produces little change in respiratory and haemodynamic parameters, although a tachycardia may occur.[18] Rapid emergence and short recovery time have been reported,[18] and Moore[13] claims an initial distribution half-life of 0·54 hours, followed by an elimination half-life of 4·05 hours. The period of amnesia started before the insertion of the epidural block and lasted until the patient had returned to the ward. Initial use of the drug produced nasal irritation and sneezing in some patients. The drug is stored in the refrigerator, and must be allowed to rewarm to room temperature to avoid pain on injection. The patients remained rousable and cooperative after the bolus of chlormethiazole whilst the epidural block was inserted. An infusion of chlormethiazole was used during the operation to produce a state of light sleep, but the patients remained rousable, and the infusion rate was progressively reduced so that the patients woke towards the end of the operation. There was no obvious respiratory obstruction in any patient. The use of chlormethiazole with epidural block has been described for major surgery,[14] mainly hysterectomies and laporotomies, and no significant changes in blood gases, blood pressure or pulse rate were found. The patients found the sedative technique pleasant and indistinguishable from normal sleep, and there were no reports of hallucinations or dreams.

Epidural anaesthesia was chosen to avoid the discomfort of infiltration techniques, and to provide complete anaesthesia of the operation site, and optimal operating conditions. 15–20 ml of lignocaine or bupivacaine were used, and this volume ensured that the sensory block included T10 and the innervation of the spermatic cord. Time of onset and recovery were obviously more rapid with lignocaine than bupivacaine, but there was no difference in operating conditions, and all patients had recovered full sensory and motor function before discharge, approximately 7 hours after admission, every patient was able to walk before discharge home. Only one patient would have preferred a general to an epidural anaesthetic. Obviously, the benefits of the epidural block over infiltration have to be considered against the inevitable occasional dural tap, and the small proportion of these that then lead to spinal headaches. If a dural tap had occurred in

any of these patients, facilities were available for the patient to be admitted to hospital. However, none of the patients in this series had a dural tap, a spinal headache, any permanent neurological sequelae or urinary retention.

The choice of postoperative analgesia for the day-case herniorrhaphy patient is limited, the intramuscular and intravenous routes cannot be used for selfmedication, and therefore there is only oral selfmedication or one of the long-acting analgesic techniques performed before the patient leaves the hospital. Pethidine and Distalgesic tablets were used as traditional strong and moderate oral analgesia, and compared against nerve blockade by either a local anaesthetic drug or a cryoanalgesic technique.

The paravertebral space was chosen for the local anaesthetic blockade because it is quick and easy to identify, and it enabled injection of a depot of the drug for prolonged effect. Bupivacaine was used, having a prolonged duration of action, in a 0·75% concentration (available on clinical trial), and mixed with dextran 70 in saline to prolong its action still further.[19] The use of 20 ml of solution for this block ensured a spread of at least two segments either side of the point of injection at T12/L1. The local anaesthetic analgesia was intended to last up to 24 hours and to cover the journey home from hospital and the period of development of wound oedema. The medial approach was used because it is both very accurate and successful, since the bony landmark is very close to the nerve, and it also minimises the risk of the complications of a pneumothorax or a dural tap.[17]

Cryoanalgesia involves a second degree nerve lesion, according to Sunderland's classification,[20] and the time for regeneration is greater than that for wound healing. Hence, cryoanalgesia is a technique which can provide analgesia for the entire postoperative healing period. Since cryoanalgesia has such a prolonged action, it is only suitable for nerves which are sensory, or whose motor component is not essential. In these hernia patients the ilio-inguinal nerve was frozen. The ilio-inguinal nerve, derived from the anterior primary ramus of the first lumbar nerve root via the lumbar plexus, pierces the internal oblique muscle mediocaudally to the anterior superior iliac spine, and distributes filaments to it.[21] It then passes through the inguinal canal lying below the spermatic cord and accompanies it through the superficial inguinal ring to supply the skin of the superomedial area of thigh and the scrotum. There may be a communication between the ilio-inguinal and the ilio-hypogastric nerves and the sizes of these nerves are inversely related. No patients demonstrated any areas of cutaneous anaesthesia, therefore, the cutaneous component of the ilio-inguinal nerve must be overlapped by other nerves. One patient developed a haematoma, and the presence of cutaneous sensation enabled early diagnosis, this patient had bilateral herniorrhaphies and there was no discomfort from the other side, therefore, cutaneous sensation is not a major source of pain. The cryoanalgesia group could be clearly differentiated by their ability to use, without discomfort, their abdominal musculature for walking or raising themselves into a sitting position, and the internal oblique muscle seems the most likely source of the muscular spasm and pain. No evidence was found to contradict traditional ideas on the anatomy of the ilio-inguinal nerve. Although a peripheral nerve is devitalised for a short distance proximal to the frozen segment,[22] retrograde blocking of axonal function has not been observed, and therefore, the motor component of the ilio-inguinal nerve to the internal oblique muscle will not be blocked by cryoblockade of the nerve distal to its passage through the muscle. Therefore, it is suggested that the muscle spasm is reflexly mediated via the sensory component of the ilio-inguinal nerve, and the most likely origin for this is the coverings of the spermatic cord. The major importance of this source of post-herniorrhaphy pain does not seem to have previously been appreciated. The cryoprobe used in this series is both cheap and simple to operate, it is pistol-shaped with a trigger which allows the nitrous oxide to flow through the probe and cool the tip, and it is connected by a coaxial flexible tube to a standard nitrous oxide cylinder.

The Distalgesic tablet consumption by the patients in the cryoanalgesia group was significantly lower than that of the patients in either the paravertebral or oral analgesia groups, and that of the paravertebral group was significantly lower than the oral analgesia group (Table 2). However, there was no difference between the pethidine tablet consumption of the paravertebral group and the oral analgesia group. The patients were told to use the pethidine for severe pain, and the Distalgesic tablets for lesser pain, but most patients found that for their pain the Distalgesic tablets gave superior relief to the pethidine tab-

Table 2. Daily requirements for supplementary analgesia in post-herniorrhaphy patients

	Distalgesic	Pethidine (50 mg)
Cryoanalgesia		
*Day 1	2·3 (1·9)	—
2	2·2 (1·7)	—
3	1·1 (1·7)	—
4	0·7 (1·5)	—
Total	6·3 (5·6)	—
†Day 1	1·9 (1·9)	—
2	1·8 (1·6)	—
3	0·4 (0·7)	—
4	0·0 (0·0)	—
Total	4·0 (3·3)	—
Paravertebral		
Day	4·6 (0·9)	1·2 (1·6)
2	4·4 (1·7)	0·6 (0·9)
3	3·8 (1·5)	0·0 (0·0)
4	1·2 (1·1)	0·0 (0·0)
Total	14·0 (4·5)	1·8 (2·5)
Oral analgesia		
Day 1	6·0 (1·6)	1·8 (1·7)
2	5·8 (3·3)	0·8 (1·4)
3	5·5 (2·5)	0·0 (0·0)
4	3·3 (1·5)	0·0 (0·0)
Total	20·5 (7·7)	2·6 (2·2)

* All ten patients in the cryoanalgesia group.
† The eight patients in the group in whom a nerve was found and cryoblocked.
All data expressed as numbers of tablets (mean and standard deviation).

lets, and this was reflected in the low number of pethidine tablets that the patients used.

In the cryoanalgesia group of ten patients, only eight of these patients had a discrete ilio-inguinal nerve. These eight patients had very little post-operative discomfort despite early mobilisation. The other two members of this group, in whom a nerve could not be cryoblocked, required 15 and 16 Distalgesic tablets, compared with the mean of 4·0 tablets for the remainder of the group, clearly demonstrating the benefit from the cryoanalgesia in the suitable group of patients.

The paravertebral injection was effectively a 0·375% concentration of bupivacaine and this did not interfere significantly with motor function. Although this block did not produce complete analgesia of the operation site after the epidural block had regressed, it did significantly reduce the pain, not only during the first 24 hours but throughout the remainder of the period under study (Fig. 1). However, throughout the post-operative period the patients who had a paravertebral injection did require more supplementary analgesia than the patients who had been cryoblocked.

The group who were just given the traditional regime of oral analgesia required more analgesia than both the other groups. One patient from the oral analgesia group, a muscular manual worker, developed severe, intermittent muscle pain as the epidural anaesthetic regressed, and this patient required two doses of papaveretum (20 mg) to control the pain and was kept in hospital overnight. He was mobilised and discharged the following morning. Two other patients were kept in hospital overnight, because when seen by the day-case anaesthetist on admission they were not considered to be suitable for day-case management, all other patients were discharged 6–12 hours after admission. Most of the patients preferred to return home the same day, only one patient said that retrospectively she would have preferred to stay in hospital overnight, because of previously undisclosed domestic problems.

The cryoanalgesia group had a better appetite than the other groups at all times, and this was used as a measure of their well-being (Fig. 2). Although the patients' activity could not be measured directly, whether they remained in bed, in a chair, or were mobile, with or without difficulty, was recorded for each day. By these criteria the cryoanalgesia patients were most active throughout the whole postoperative period (Fig. 3). The paravertebral patients were less active than the cryoanalgesia patients but more active than the oral analgesia patients, and as with the amount of supplementary analgesia, the benefit of the paravertebral block greatly exceeded its probable duration of action.

The cryoanalgesia patients were driving cars slightly sooner than the other patients. They also returned to a state of normal activity, and felt fit to return to work significantly earlier than the other patients (Table 3). There is less difference between the times at which the patients actually returned to work, as many of the firms in this area give a minimum fixed period of sick-leave for herniorrhaphies of 5 or 6 weeks, and the patients were not allowed back to work even though they felt fit.

The overall conclusion from these results must be that the cryoanalgesia patients have less pain,

Table 3. Rate of recovery of activity in patients after herniorrhaphy

	Cryoanalgesia	Paravertebral blockade	Oral analgesia
Driving a car*	3·7 (2·7) (n = 7) (3·3 (2·7))‡	5·2 (1·8) (n = 8)	6·5 (4·2) (n = 7)
Climbing stairs	2·2 (2·3) (n = 9) (1·3 (1·5))‡	2·7 (2·3) (n = 9)	2·7 (1·6) (n = 9)
Normal activity	15·0 (9·1) (n = 10) (13·1 (7·7))‡	22·0 (16·0) (n = 9)	28·9 (12·3) (n = 9)
Fit for work†	15·6 (9·0) (n = 9) (14·0 (8·2))‡	24·5 (7·0) (n = 8)	37·5 (21·4) (n = 8)
Return to work†	31·7 (12·7) (n = 9) (30·4 (12·9))‡	35·0 (8·1) (n = 8)	37·5 (21·4) (n = 8)
	10 forms *3 non-drivers †1 retired	9 forms *1 non-driver †1 retired	9 forms *2 non-drivers †1 retired

‡ Results for the eight patients in whom a nerve was found and cryoblocked.
All data expressed in days (mean and standard deviation).

better appetites and are more active than the paravertebral or oral analgesia patients. However, the whole technique of day-care and epidural anaesthesia must also effect the postoperative period. It is only recently that the surgical merits of short-stay herniorrhaphy have been generally accepted,[1,5,9–11] and consideration and investigation has progressed to the anaesthetic and analgesic aspects. In 1979 Makuria *et al.*[23] compared general and local anaesthesia for herniorrhaphy in short-stay patients. Although they found advantages using local rather than general anaesthesia, 60% of their local anaesthetic group still required papaveretum, pethidine or morphine, and since their patients were in hospital for $3{\cdot}2 \pm 1{\cdot}2$ days, one would have expected these patients to have been less active, and thus in less pain than the day-case patients. Their group of patients also required longer to return to work, $53{\cdot}9 \pm 23{\cdot}9$ and $56{\cdot}6 \pm 27{\cdot}5$ days respectively for their local and general anaesthetic groups, compared with our cryoanalgesia day-case group of $31{\cdot}7 \pm 12{\cdot}7$ days. Although, as mentioned before, this period may be affected by minimum periods of absence prescribed by employers, it does not seem likely that employers would insist on a 7 or 8 week period of absence after herniorrhaphy, and this prolonged absence must be due to the patient's need for a protracted convalescent period.

Cryoanalgesia of the ilio-inguinal nerve appears to be a significant advance in postoperative analgesia for hernias, both for inpatients and especially for day-case or short-stay patients. One theoretical objection may be the creation of necrotic tissue near to the hernia darn. However, freeing the nerve and using the cryotherapy away from other tissues limits the amount of necrotic tissue, and no wound infections occurred. The preservation of cutaneous sensation is an advantage because it enables early recognition of any possible haematoma or infection, and prevents trauma to the wound. The main limitation on cryoanalgesia as a technique for postoperative analgesia is the number of nerves, without a significant motor component, involved in the conduction of the postoperative pain that can be isolated during the operation. However, even if the technique were to be limited to herniorrhaphies, it would still be worthwhile as it produces prolonged, safe postoperative analgesia in an operation which accounts for at least 10% of surgical cases in the United Kingdom.[24]

The use of the paravertebral blockade cannot be ignored, although it was not as effective as the cryoanalgesia. The paravertebral injection only required a spinal needle, syringe and local anaesthetic, and so is universally available, it can be used in all cases and is not limited by abnormal anatomy of the nerves, and it demonstrated clearly the importance of good initial postoperative analgesia in reducing the patient's requirement for further analgesia throughout the whole postoperative period (Fig. 1).

A larger series of patients is in progress at present, using short-stay patients so that analge-

sia can be monitored more accurately, and the incidence of complications compared with a control group. Meanwhile on the basis of a limited number of cases, it is felt that herniorrhaphy as a day-case, using an epidural, chlormethiazole sedation and cryoanalgesia should be considered as a technique which is safe, economical and practical, and associated with a high degree of patient comfort and satisfaction.

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References

1. FARQUHARSON EL. Early ambulation: with special reference to herniorrhaphy as an outpatient procedure. *Lancet* 1955; **ii:** 517–9.
2. WILLIAMS JA Outpatient operations: 1. The surgeon's view. *British Medical Journal* 1969; **i:** 174–5.
3. STEPHENS FO, DUDLEY HAF. An organisation for outpatient surgery. *Lancet* 1961; **i:** 1042–4.
4. RUCKLEY CV, MACLEANM, LUDGATE CM, ESPLEY AJ. Major outpatient surgery. *Lancet* 1973; **ii:** 1193–6.
5. RUCKLEY CV, CUTHBERTSON C, FENWICK N, PRESCOTT RJ, GARRAWAY WM. Day-care after operations for hernia or varicose veins: a controlled trial. *British Journal of Surgery* 1978; **65:** 456–9.
6. CHANT ADB, SPENCER T, HISHON S, WHITCHER D, BROOKS A. Another approach to the hernia waiting-list. *Lancet* 1972; **ii:** 1017–8.
7. OOSTERLEE J, DUDLEY HAF Surgery in outpatients. *British Medical Journal* 1979; **2:** 1459–60.
8. PRESCOTT RJ, CUTHBERTSON C, FENWICK N, GARRAWAY WM, RUCKLEY CV. Economic aspects of day-care after operations for hernia or varicose veins. *Journal of Epidemiology and Community Health* 1978; **32:** 222–5.
9. ADLER MW. Randomized controlled trial of early discharge for inguinal hernia and varicose veins. *Annals of the Royal College of Surgeons of England* 1977; **59:** 251–4.
10. RUSSELL IT, BRENDAN DEVLIN H, FELL M, GLASS N, NEWELL DJ. Day-case surgery for hernias and haemorrhoids. *Lancet* 1977; **i:** 844–7.
11. MORRIS D, WARD AWM, HANDYSIDE AJ. Early discharge after hernia repair. *Lancet* 1968; **i:** 681–5.
12. GARRAWAY WM, CUTHBERTSON C, FENWICK N, RUCKLEY CV, PRESCOTT RJ. Consumer acceptability of day-care after operations for hernia or varicose veins. *Journal of Epidemiology and Community Health* 1978; **32:** 219–21.
13. MOORE RG, TRIGGS EJ, SHANKS CA, THOMAS J. Pharmacokinetics of chlormethiazole in humans. *European Journal of Clinical Pharmacology* 1975; **8:** 353–7.
14. SCHWEITZER SA. Chlormethiazole (Hemineurin) infusion as supplemental sedation during epidural block. *Anaesthesia and Intensive Care* 1978; **6:** 248–50.
15. LLOYD JW, BARNARD JDW, GLYNN CJ. Cryoanalgesia: a new approach to pain relief. *Lancet* 1976; **ii:** 932–4.
16. WOOD GJ, LLOYD JW, EVANS PJD, BULLINGHAM RES, BRITTON FJ, FINCH DRA. Cryoanalgesia and day-case herniorraphy (letter). *Lancet* 1979; **ii:** 479.
17. SHAW WM. Medial approach for paravertebral somatic nerve block. *Journal of the American Medical Association* 1952; **148:** 742–4.
18. WILSON J, STEPHEN GW, SCOTT DB. A study of the cardiovascular effects of chlormethiazole. *British Journal of Anaesthesia* 1969; **41:** 840–3.
19. HOHMANN G. Kreislaufwirkung einer Macrodex-Lidocain-1-Noradrenalinlösung in der Peridural-anaesthesie. (Circulatory action of a dextran-lignocaine-noradrenaline solution in epidural anaesthesia). *Anaesthesist* 1956; **5:** 18–9.
20. SUNDERLAND S. A classification of peripheral nerve injuries producing loss of function. *Brain* 1951; **74:** 491–516.
21. WARWICK R, WILLIAMS PL. (Eds) *Gray's anatomy*, 35th ed. Edinburgh: Longman;1973: 1051.
22. CARTER DC, LEE PWR, GILL W, JOHNSTON RJ. The effect of cryosurgery on peripheral nerve function. *Journal of the Royal College of Surgeons of Edinburgh* 1972; **17:** 25–31.
23. MAKURIA T., ALEXANDER-WILLIAMS J, KEIGHLEY MRB. Comparison between general and local anaesthesia for repair of groin hernias. *Annals of the Royal College of Surgeons of England* 1979; **61:** 291–4.
24. ELLIS H. Inguinal hernia. *British Journal of Hospital Medicine* 1979; **4:** 9–14.