

The prediction of incisional hernias by radio-opaque markers

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Summary

On the hypothesis that incisional defects occur soon after operation but the resulting hernia may not be diagnosed until months or years later, we attached three to five pairs of stainless steel haemostatic clips to the cut edges of the anterior aponeurosis during the closure of 59 major laparotomy incisions and X-rayed the abdomen one month later. Three patients were withdrawn and the remaining 56 were examined with special reference to incisional herniation at their six-month follow-up visit. The senior author subsequently arranged a series of extra clinics for surviving patients up to three years later (median 30 months after operation). He had no knowledge of the results of the abdominal X-rays when assessing whether or not the patient had a hernia.

Six patients were found to have incisional hernias, and correlation with the measurements on the one-month X-rays showed separation of pairs of clips ranging from 12–70 mm (median 40). Three of the six hernias were discovered within seven months, the remaining three at 13, 28 and 29 months. In contrast none of the 50 patients without incisional hernias had more than 9 mm of separation of any pair of clips on the one-month X-ray.

We conclude that the origins of incisional hernias can be traced back to events during the first month after operation and that they are not the result of later weakening of a well-healed laparotomy wound.

Introduction

Failure of healing of the abdominal wall after laparotomy may, in its most florid manifestation, result in complete dehiscence (burst abdomen). This complication is rare following the almost universal adoption of monofilament non-absorbable sutures inserted with deep bites on each side of the musculo-aponeurosis. On the other hand incisional hernias are common and are sometimes discovered months or years after operation. The incidence depends on a number of well-documented risk factors and is about 10% (1–3).

In a series of 500 incisional hernias repaired at the Shouldice Clinic between 1945 and 1960, Akman (4) re-

ported that 52% were noticed by the patient within six months, 68% within a year, 79% within two years, 88% within three years, 93% within four years and 97% within five years. The implication of these data, and of more recent prospective studies (5,6) is that soundly healed laparotomy wounds can weaken sufficiently over a period of many months so as to allow the protrusion of a hernia.

There is, however, an alternative hypothesis. It is possible that the parting of the sutured aponeurosis occurs within the first few weeks after the operation and that the gap between the two aponeurotic edges is filled by weak fibrous tissue which gradually stretches to allow the later protrusion of a hernia which, in essence, had been present from the early postoperative period.

It was to test this hypothesis that we devised a radiographic technique for establishing whether sutured aponeuroses which remained in apposition during the first month after operation were immune to the later development of an incisional hernia.

Patients and methods

At the conclusion of 59 unselected major laparotomies we attached three to five pairs of stainless steel haemostatic clips (Ligaclips) to the sutured edges of the anterior aponeurosis. Patients were seen for routine review between four and six weeks after operation and postero-anterior X-rays taken of the region of the abdominal wound. The extent of separation of opposing pairs of Ligaclips was measured and recorded on research proformas, not in the patients' casenotes.

Each surviving patient was examined about six months after operation and again after the elapse of between 10 and 43 months from the date of operation. Incisional herniation was defined as a defect with sharp margins which allowed a bulge to appear when the patient coughed or strained while standing. The decision whether any incisional hernia was present or absent was made by the senior author who had no knowledge of the results of the one-month X-ray.

Patients were fully informed of the purpose of the study and of the reason for the abdominal X-rays.

Results

We found no evidence that the insertion of Ligaclips interfered with wound healing or contributed to wound infection. Our analysis concerned 59 patients who had Ligaclips inserted and who were X-rayed approximately one month later. Three could not be evaluated, two because X-rays showed that most of the clips had been discharged due to wound infection and the third because the incision, which was re-opened six weeks later, could not be assessed for the presence or absence of a hernia.

The remaining 56 patients were examined up to 3½ years after operation (median 30 months) and six incisional hernias were found at 5, 6, 7, 13, 28 and 29 months. When these findings were correlated with the one-month X-rays we found that the clips were separated by 43, 70, 60, 22, 12, and 20 mm (Fig. 1). The three early hernias were symptomatic, the later three were not. All the sound wounds, on the other hand, showed less than 10 mm of separation between pairs of clips (Fig. 2). In 43 no separation at all was seen and in the remaining seven the maximum was 3, 4, 4, 5, 6, 8 and 9 mm. Forty five of the 50 patients were re-X-rayed after six to 36 months and we found three in whom the clips were by then 10, 12 and 18 mm apart. The first two have shown no signs of an incisional hernia, the third was lost to follow-up after six months.

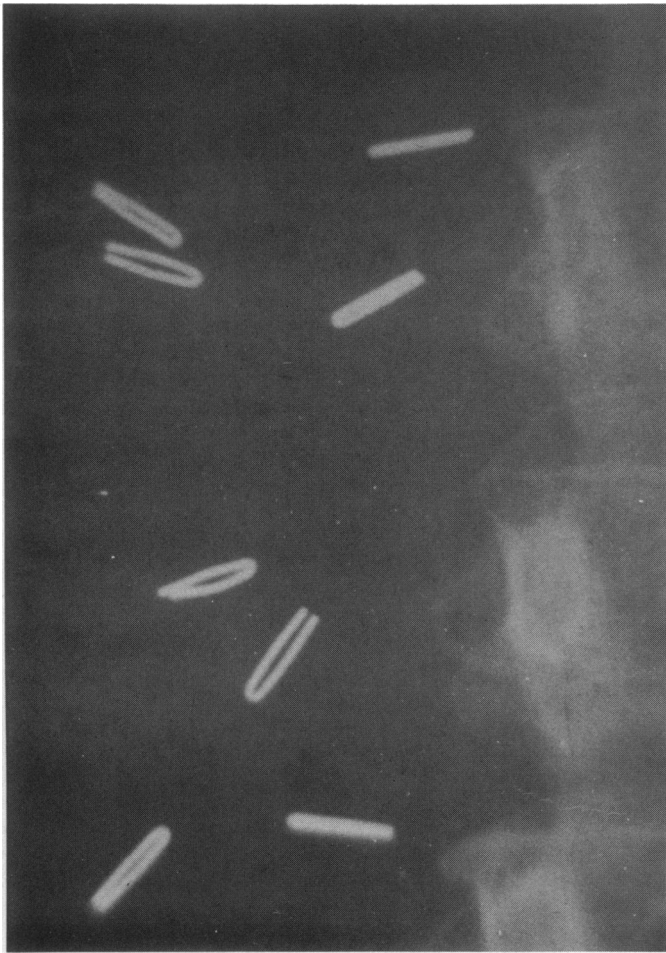


FIG. 1 Separation of Ligaclips, incisional hernia.

Discussion

The pathology of wound healing has been extensively studied, notably in San Francisco by Dunphy (7) and later by Hunt (8). Healing occurs in four stages—angiogenesis, fibroplasia, collagen synthesis and collagen maturation. When platelets are activated by thrombin they release a

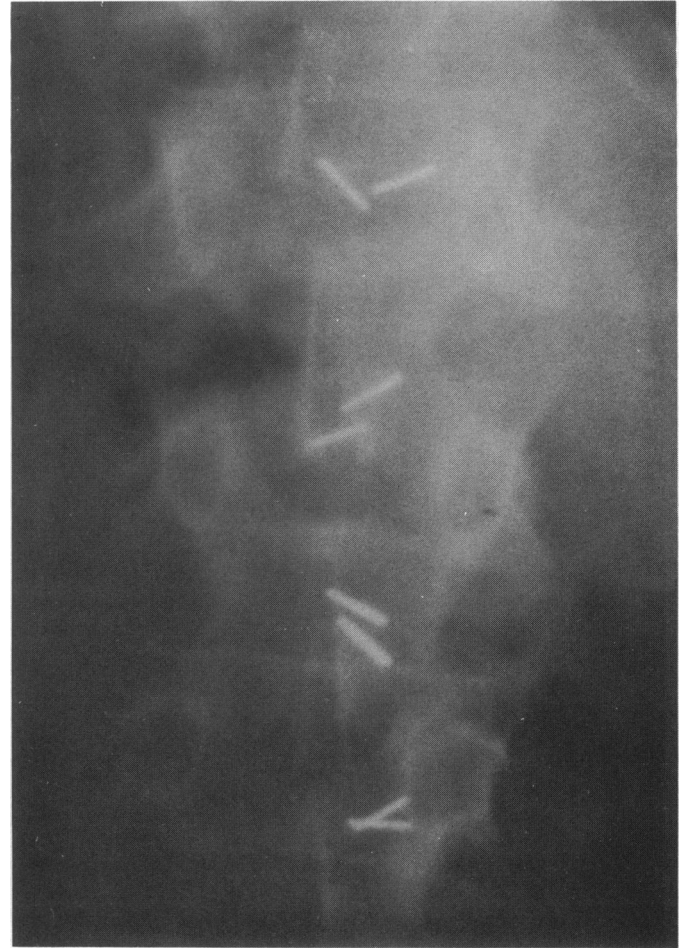


FIG. 2 No separation of Ligaclips, no incisional hernia.

mitogen which stimulates fibroblasts and smooth muscle cells to synthesize collagen (9). The collagen fibres are at first arranged haphazardly but later mature to resemble undamaged collagen, the cross-banded fibrils being arranged in bundles (10). When collagen matures, the bundles which run along the lines of stress are augmented and those which run across these lines are absorbed, possibly due to the action of fibronectin.

We have shown that it is possible to predict the occurrence of an incisional hernia by inserting pairs of Ligaclips in the abdominal aponeurosis during operation and measuring their separation on X-rays one month later. We suggest, therefore, that incisional hernias occur early even though some of them are not diagnosed until later. Although the number of incisional hernias is small, our data suggest that late-developing hernias are associated with less separation of the aponeuroses than those which are apparent within the first few months after the operation.

We conclude from the data which we present that abdominal wall aponeuroses which remain in contact for the first month after operation do not allow the later development of an incisional hernia, whereas a gap of more than 10 mm between the aponeurotic edges is filled by a weak zone of connective tissue which subsequently stretches and allows the protrusion of a hernia.

Many of these operations were performed by the following surgical registrars: J R Ausobsky, S S Brennan, A D Mayer and I R Pickford. We are grateful to the Department of Radiology for their cooperation.

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Notes on books

Coloproctology and the Pelvic Floor edited by M M Henry and M Swash. 401 pages, illustrated. 1985. Butterworths, London. £45.

This book summarises the experience of St Mark's Hospital London in regard to disorders of the pelvic floor including the sphincters. Part 1 gives a lucid and up to date account of the anatomy and physiology of the region. Part 2 describes techniques of investigation including ano-rectal manometry, electromyography and nerve stimulation. Part 3 is related to the management of various disorders such as solitary ulcer of the rectum, descending perineum syndrome, faecal incontinence and rectal prolapse. Each chapter is fully referenced and illustrated and the volume will certainly be the definitive reference work for colorectal surgeons for some time to come.

Fittingly, it is dedicated to Alan Parks who first stimulated research into this important group of disorders.

Laryngectomy is not a Tragedy by Sydney Norgate. 56 pages, paperback. 1984. Churchill Livingstone, Edinburgh. £3.95.

All ENT surgeons should be aware of this book and have a stock on their departmental shelves to pass on to their patients who undergo the operation of laryngectomy. Written in an easy to read style by a patient who has undergone the operation, a moving and convincing account is given of the problems caused by loss of normal speech. The method of learning to speak again is described together with many hints and tips of practical use. Mr L F W Salmon, Past President of The British Association of Otolaryngologists, contributes a laudatory foreword.

Surgery of the Hip Joint, Volume I edited by Raymond G Tronzo. 426 pages, illustrated. 2nd edition. 1984. Springer-Verlag, New York. DM 298.

This is a completely revised second edition of a standard reference volume which was originally published in 1973. Volume 1 covers fundamental basics in hip surgery and disorders of the hip in children. Subsequent volumes will be devoted to adult hip problems. Well referenced and illustrated this second edition is likely to have a wide sale and be required reading for orthopaedic surgeons everywhere.

A Royal Catastrophe by Vincent Corbett. 70 pages, illustrated, paperback. Printed privately—available from author. £2.50.

This small pocketbook gives a most readable account of the unfortunate death in childbirth in 1817 of Princess Charlotte, the daughter of King George IV. It is the definitive account of a famous obstetric disaster and has been brought fully up to date with the benefit of new historical material. An ideal bedside book for all surgeons—not just obstetricians.

What Sort of Doctor? 27 pages, paperback. 1985. The Royal College of General Practitioners. £5.

After a difficult period of gestation the concept of professional audit is now accepted by almost all hospital doctors and much has been written about it in recent years. This booklet, issued by The Royal College of General Practitioners, looks at audit in general practice and suggests a method by which the quality of care in general practice may be assessed. Four specific areas are studied: clinical competence, accessibility, the ability to communicate and professional values. It is an exciting publication and one that deserves study not only by general practitioners but by doctors in all branches of the profession.

Biomechanics of the Hip as Applied to Osteoarthritis and Related Conditions by Paul G J Maquet. 309 pages, illustrated, 1985. Springer-Verlag, Berlin. DM 298.

The author of this book is convinced that it makes more sense for a patient with osteoarthritis of the hip to be treated with preservation of the joint rather than undergo too quickly a replacement arthroplasty. In this monograph Dr Maquet explains his methods and presents his results including long term follow-up data. Numerous before and after treatment radiography testify to the efficacy of the technique in selected cases.

Labat's Regional Anesthesia. Techniques and Clinical Applications by John Adriani. 208 pages, illustrated. 4th edition. 1985. Warren H Green, St. Louis, Missouri. \$75.

The fourth edition of a classic textbook of regional anaesthesia which was first published as long ago as 1922. In this latest edition, new material has been introduced including a full discussion on epidural anaesthesia and the application of regional anaesthesia to obstetrics. Chapters on topical anaesthesia and the history of the early development of regional anaesthesia are also included. Surgeon readers of this notice may like to know that the famous William Mayo wrote a Foreword to the 1929 edition of this book in which he stated 'The expert surgeon who is also an expert in the use of regional anaesthesia can resect the stomach, the rectum or any portion of the intestinal tract with ease'.

Basic Physics and Measurement in Anaesthesia by G D Parbrook, P D Davis and E O Parbrook. 360 pages, illustrated, paperback. 2nd edition. 1985. William Heinemann Medical Books, London. £17.50.

Only three years after the first edition was published, this book has been fully revised and new material added. In keeping with the aims of the book, more examples of the clinical applications of physical principles are included and many new illustrations have been prepared. Of interest to all who seek an introduction to the importance of physics in clinical anaesthesia be they doctors, nurses or technicians. This book is likely to have a continuing ready sale.