

WORK RELATED ASPECTS OF INGUINAL HERNIA: A LITERATURE REVIEW

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Introduction: There is a traditional belief that that an inguinal hernia can be the result of increased intra-abdominal pressure (IAP) and therefore the development of a hernia may be attributed to single strenuous or recurrent strenuous events. As a result of this, litigation in this area is frequent. **Methods:** Medline was searched for English language publications using the keywords of 'hernia' or 'hernia AND recurrence' combined with 'work related', 'physical activity' and 'intra abdominal pressure'. The reference lists of appropriate papers identified on the original search were also checked to identify all related publications. **Results:** The search revealed 268 papers of which 59 were identified as appropriate to the subject of this review. Although publications in this area are scarce, from the literature available to date, there is no evidence to support the idea that single or recurrent strenuous events or early return to work related activity should result in the formation or recurrence of an inguinal hernia. **Conclusion:** Although immediate pain at the time of an intensive or recurrent activity followed by a new diagnosis of a hernia supports a link between the activity and the hernia occurrence, it is likely that a congenital or acquired weakness in the connective tissue or muscles of the patient meant that hernia occurrence was almost inevitable. This may have significant implications regarding 'work related' hernia and its associated litigation.

KEYWORDS: HERNIA, PHYSICAL ACTIVITY, OCCUPATIONAL, INTRA-ABDOMINAL PRESSURE
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INTRODUCTION

Each year, in Britain, approximately 1 in 1000 of the population will develop a groin hernia. This results in an estimated 80,000 operations every year, with 90% of these being performed on males.¹ Although the condition is rarely fatal or permanently disabling, it is a frequent cause of lost work time and hernia surgery consumes a significant proportion of healthcare resources.² Traditionally it has been taught that that the structural failure represented by a hernia is precipitated by increased intra-abdominal pressure (IAP) often secondary to obesity, chronic lung disease, prostatic hypertrophy, haemorrhoids, smoking or heavy lifting.^{3,4}

As there is a common belief that the development of a hernia may be attributed to a single strenuous or recurrent strenuous events, litigation in this area is frequent.⁵ A commonly encountered claim by the general surgery expert witness is that of an employee seeking financial compensation following 'an unreasonable lifting task' and the subsequent development of an inguinal hernia. However, despite the large number of claims in this area, evidence that a hernia may result from single or recurrent strenuous events is scarce.

This paper examines the possible link between IAP and abdominal wall hernia development, the evidence to support work related hernia and the risk of early return to work in hernia recurrence. Most of the evidence available is centred on inguinal

hernia formation but it seems logical that the same evidence may be applicable to abdominal wall hernia in general.

METHOD OF LITERATURE REVIEW

Manuscripts related to work related aspects of inguinal hernia were systematically sought using the Medline database. Search strategies used included the following search terms: 'hernia' or 'hernia and recurrence' combined with 'work related', 'physical activity' and 'intra abdominal pressure'. Searches were restricted to the English language and the last search was performed on 1 August 2007. The reference lists of retrieved reports and review articles were hand searched for additional related publications. No abstracts, correspondences or unpublished observations were included. Authors were not contacted for original data.

Reports that were included consisted of those that specifically discussed the connection between raised intra-abdominal pressure due to single or recurrent strenuous events and hernia formation. 'Sportsman's groin', which does not usually involve a hernia, is therefore not considered in this review. Other reports that were excluded were those related to other aspects of hernia treatment, operative technique or type. All three authors agreed upon all appropriate references.

SEARCH RESULTS

Our search strategy identified 268 papers, of which 209 were excluded, as they were not relevant to the subject matter of the present review. The limited number of appropriate papers in this area is in contrast to the vast number of publications related to hernia. The search term 'hernia' produced over 40,000 results, with 1437 of these published in 2007.

Intra-abdominal pressure and abdominal hernia

It has been suggested that an increased IAP is linked to the occurrence of abdominal wall hernia. More specifically, it has been suggested that any lifting action, which causes a person to strain, will result in a rise in IAP and this in turn may lead to abdominal wall hernia formation.^{3,6-8}

It is believed that the mechanism of raising IAP through coordinated contraction of the abdominal muscles provides both trunk stabilisation and lumbar spine relief while lifting.⁹ In a study by Cresswell and Thorstensson, IAP and electromyographical muscle activity were recorded during sagittal lifting and lowering against an iso-kinetic dynamometer. They demonstrated that although muscle activity was highest during lowering, IAP was highest during lifting. It was also shown that on sub-maximal effort there was a linear relationship between increasing IAP and increasing lifting or lowering force, but IAP was always less during lowering than lifting.¹⁰ The same authors demonstrated that the level of IAP generated during lifting varied significantly depending on the lifting strategy employed and that the ability to generate IAP in functional situations could be improved by training the trunk muscles.^{11,12} An increased incidence of hiatus herniae in a younger age group in weightlifters has been reported and is presumed to be caused by increased IAP.^{13,14}

A study by Cobb and colleagues examining IAP change during a variety of activities (standing, sitting, bending at the waist or knees, performing abdominal crunches, jumping and bench pressing 11.3kg) in healthy individuals (Table 1) demonstrated only a modest rise in IAP during lifting while correctly bending at the knees.¹⁵ They reported a much larger rise in IAP associated with jumping or coughing. IAP at rest and during activity has been shown to be higher in patients with a higher BMI but does not vary with gender.¹⁵⁻¹⁷ Although in one study, a significant increase in IAP was demonstrated on straining, the group with abdominal wall hernia had a significantly lower IAP compared with a control group (straining and at rest).¹⁸

Other causes of increased IAP include continuous ambulatory peritoneal dialysis (CAPD). When a group of children undergoing CAPD was studied, a higher IAP was found in the children with abdominal hernia than those without. The actual figures for IAP were, however, significantly lower than for adults.¹⁹ These studies would shed significant doubt on the importance of raised IAP as a significant factor in the formation of abdominal wall hernia and suggest that another factor such as anatomical weakness, either congenital or acquired, may be more important.

Inguinal hernia

In the UK, the lifetime risk of inguinal hernia is 27% for men and 3% for women.¹ Inguinal hernia accounts for 80% of all hernias diagnosed.⁸ Although it is suggested that there is an increased risk of abdominal wall hernia with varicose veins, prostatic hypertrophy haemorrhoids and ascites, all factors associated with either intermittent or sustained raised intra-abdominal pressure, it appears that the

TABLE 1. RANGE OF MAXIMUM PRESSURES GENERATED FOR DIFFERENT MANOEUVRES AMONG 20 SUBJECTS

Manoeuvre	Minimum (mm Hg)	Maximum (mm Hg)	Mean (mm Hg)	SD
Supine	-1	6	1.8	2.2
Standing	15	27	20	3.8
Sitting	10	21	16.7	2.9
Stairs	40	110	68.9	17.4
Abdominal crunch	7	47	26.7	10.7
Bend at waist	6	30	14.4	5.3
Bend at Knees	14	30	20.6	4.4
Cough	40	127	81.4	25.6
Standing cough	64	141	107.6	23
Valsalva	20	64	39.7	11
Standing valsalva	32	116	64.9	22
Jumping	43	252	171	48.4
Bench press	2	34	7.4	7.3
Arm curl	17	37	25.5	6

Table 'Range of maximum pressures generated for each maneuver among 20 subjects' taken from Cobb et al. Normal intraabdominal pressure in healthy adults. J Surg Res (2005) vol. 129 (2) pp. 231-5

incidence of abdominal wall hernia is low in the presence of obesity, chronic cough, constipation and physical activity at work, again all factors said to be associated with increased IAP.³

Direct inguinal hernia

Direct inguinal hernia results from a weakness in the fascia of the posterior wall of the inguinal canal. Although previously considered to be due to persistent straining with raised IAP (heavy lifting, physical exertions, chronic constipation, cough or bladder outflow obstruction), this can no longer be considered to be the main cause.²⁰ These hernia are rare in weightlifters, and regular sporting activity may in fact confer some protection from hernia formation.²⁰⁻²²

An increasing amount of research suggests that the connective tissue in patients with direct inguinal hernia is defective compared to those without inguinal hernia.²³⁻²⁵ This suggests that direct inguinal hernia are more likely to be related to a congenital or an acquired weakness, not related to activities which raise IAP.^{26,27} Thus in the work or recreational setting, it is likely that when a hernia diagnosis follows a specific strenuous event, the event in question has merely brought forward the occurrence of a hernia, and it would most likely have occurred anyway around a similar time. It is, however, difficult to estimate the exact time frame, as the natural history of hernia development is variable.

Although some studies have concluded that the formation of abdominal wall hernia can be work related, occurring at a younger

age in occupations involving manual labour or heavy lifting.⁶⁻⁸ These studies were based on employers' reports of work related cases of hernia and may be influenced by their belief that the two are related. One of these studies even conceded that even if the increased IAP associated with manual work and heavy lifting was a contributing factor to hernia formation, it may only be of significance where there was a pre-existing structural defect.⁸ If patients with a pre-existing structural defect suffer a hernia due to work related increased IAP, is this sufficient to label it a work related condition? It may be better to conclude that heavy lifting may lead to hernia formation only if there is a pre-existing weakness.²⁸ That said, there remains the commonly held belief that abdominal hernia can be the result of a single strenuous event. Smith and colleagues reported a consecutive series of 129 patients presenting with inguinal hernia.⁵ Only in nine (7%), did the patient have a 'convincing history suggestive' of an associated strenuous event. However, the time from this event to the diagnosis of the hernia was up to four years. The authors of this paper suggested four tests that could support a causal link between an event and the development of a hernia. In brief, the strenuous event had to be officially reported, with severe groin pain at the time of the event, a diagnosis of inguinal hernia made by a doctor, within at most 30 days but preferably three days, and no previous history of inguinal hernia.⁵

In another study, 133 consecutive patients presenting with a hernia (of which the majority were inguinal) were examined. Fourteen patients (11 %) reported a sudden development of the hernia, but on detailed questioning of these patients, there was no good evidence to point to a single strenuous event as the cause.²⁹ Another similar study reported 108 patients who alleged that their hernia was the result of an accident, clearly a small subset of the hernia patient population. While 51% did have an alleged identifiable strenuous event, of the remaining 49%, no hernia was detectable in 23%, there was no single event in 19% and the hernia was documented present before the alleged accident in 6%.³⁰ Thus, the available evidence would suggest that a direct inguinal hernia is rarely (if ever) causally linked with a single strenuous event.

Indirect inguinal hernia

It is more common to describe indirect inguinal hernia as congenital. This type of hernia usually represents a patent processus vaginalis (PPV), which occurs when there is incomplete obliteration of the embryological protrusion of the peritoneum that precedes testicular descent into the scrotum. Although indirect inguinal hernia may be present at birth, it may present at any time from birth until old age. It can be bilateral and presentation may be brought forward by activities which suddenly or persistently raise IAP. An autopsy study from 1925 demonstrated 20% of adults to have a patent processus vaginalis.³¹ The lifelong prevalence of indirect inguinal hernia is however smaller than this, which would suggest that a person with a PPV might not necessarily develop an indirect inguinal hernia unless another trigger factor is present. However, the chance of developing an inguinal hernia in a patient with a PPV would appear to be four-fold greater than that of a patient without a PPV.³²

If a patient develops a sudden acute pain in the right groin followed by a lump, confirmed as a hernia, which has been brought on by an acute episode of heavy lifting or straining, then it is reasonable to assume that this incident precipitated the development of

the hernia. Again one has to accept that patients with an indirect inguinal hernia could have developed the hernia at any time and it has simply presented sooner than it would have done anyway. As for a direct inguinal hernia, the time frame shift is difficult to predict.

Return to work after inguinal hernia repair

Following an uncomplicated inguinal hernia repair, the advice given to patients is often inconsistent.^{33,34} This has led to a wide variation in expected time off work and restriction of normal activity.^{35,36} Two surveys from the last 15 years show that, when the occupation involves heavy manual lifting, the recommended time off work can vary from a few days to 12 weeks.³⁴ Traditionally, the long duration of convalescence (up to six to eight weeks) has been attributed to pain, custom or fear of recurrence rather than based on a sound evidence.

Guidelines from the Royal College of Surgeons of England, from 1993, recommend that adults undergoing inguinal hernia repair should be fit to return to office work after two weeks and heavy work after four weeks regardless of the surgical technique employed.³⁷ A surgeon who advises immediate return to unrestricted activity is more likely to promote a faster recovery than one who gives more cautious advice.³⁸⁻⁴² One study showed a median time to return to work of seven days, which was equal to the median expected time to return to work.⁴³ If social circumstances allow, patients may be discharged from hospital within a few hours of hernia repair with little discomfort and only requiring mild analgesics. Unrestricted activity should be encouraged immediately within a reasonable level of discomfort experienced by the patient. With adequate pain control and following an uncomplicated hernia repair, most patients should be encouraged to resume normal activity and work immediately no matter what the nature of their occupation.⁴⁴ Thus, pain control rather than a predetermined length of time should guide the return to full activity.

The level of post-operative pain is unaffected by the type of open hernia repair performed.⁴⁵ However with increasing training and experience in minimal access inguinal hernia repair, such techniques have allowed further improvement in rate of recovery.⁴⁶ When compared to open techniques, both total extraperitoneal (TEP) inguinal hernia repair and trans-abdominal preperitoneal (TAPP) hernia repair have been associated with even shorter durations of hospital stay, lower pain scores, less requirement for analgesia, earlier post-operative ambulation and fewer lost work days.^{47,48} This benefit in return to work and normal activity is with a similar or lower rate of hernia recurrence and risk of major complication. Recent updates to the NICE guidelines on hernia repair concluded that laparoscopic surgery is recommended as one of the treatment options for the repair of inguinal hernia, and is the 'preferred technique for bilateral or recurrent hernia after the open technique'.⁴⁹ While a recent Cochrane review concluded that there were insufficient data to conclude any advantage of one type of laparoscopic repair over the other, the individual benefits of minimal access techniques as compared to open surgery are not the focus of this paper.⁵⁰

The major determinant of return to work may be the patient's expectation and socioeconomic group.⁴³ With meticulous surgical technique combined with a consistent statement to the patient regarding expected recovery and return to work, it is possible to avoid prolonged periods of convalescence in otherwise fit patients irrespective of the actual operation performed.⁵¹ Minimising the period off work following hernia repair will minimise the potential loss of earnings

for the patient, and in addition, early return to work could benefit the economy overall.⁵²

Early return to work and recurrence rate

Although there is a concern that early mobilisation and return to work after hernia repair may increase the rate of hernia recurrence, this is not so.⁵² Furthermore, recurrence of an inguinal hernia is not influenced by the period of convalescent time off work.⁵² Advice on this interval off work should generally not be influenced by the type of hernia, or the physical content of the patient's occupation.⁵³ The integrity of a repair of a hernia depends on good surgical technique, appropriately strong sutures and the correct application of prosthetic mesh support.⁵⁴ The reduction in post-operative pain, and the risk of recurrence associated with hernia repairs carried out without tissue tension, allow patients to return to normal activities, including driving, as early as one week or less after surgery depending on their level of discomfort and the type of analgesics they are requiring. Post-operative advice should be that physical activities should not be restricted but governed by the patient's level of comfort.⁵⁵ Following clear instructions, patients may return to work as early as one week following surgery and probably even earlier, with no increase in the rate of recurrence when compared to national averages.⁵⁶ After ambulatory surgery, patients should be relatively pain free at three days and be able to resume normal activities at seven days. Return to work may be affected by other human factors such as the patient's outlook on life.⁵⁷ The surgeon should therefore tailor their counselling appropriately to the personality of the patient. With modern techniques and anaesthesia there is no justification for patients to remain off work for the traditional six weeks.⁵⁸ A further area of concern is the return to heavy manual work and the long-term rate of hernia recurrence. Currently, only one paper has examined this and found no evidence to show that heavy manual work results in an increased rate of long term hernia recurrence.⁵⁹

SUMMARY

This paper questions the traditional association between strenuous events and the development of an inguinal hernia or other abdominal wall hernia in adults. This will have significant implications regarding 'work related' hernia and its associated litigation. Immediate pain at the time of an intensive or recurrent activity followed by a new diagnosis of a hernia within the following three days clearly supports a link between the activity and the hernia occurrence. However, it is likely that this activity merely speeded up the hernia occurrence as a congenital or acquired weakness in the connective tissue or muscles of the patient meant that hernia occurrence was almost inevitable. Although the exact nature of this time shift is difficult to predict, as the natural history of abdominal wall hernia is poorly understood, it is likely that the time from development of a small to a large hernia is variable from weeks to years.

From the literature available to date, there is no evidence to support the idea that single or recurrent strenuous events can result in the formation of abdominal wall hernia, which would not have occurred anyway. There is also no reason that, following a hernia repair, patients should not be mobilised early and indeed, if comfort level allows, return to work within days. No matter what the nature of the occupation of the patient, there is no clear evidence to support a link between single or recurrent strenuous events and subsequent hernia recurrence.

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