Medico-legal consequences of post-operative intra-abdominal adhesions

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Abstract
Post-operative adhesions are an almost invariable consequence of abdominal or pelvic surgery, no matter whether this is performed by the open or laparoscopic technique. Their most important morbidity is small bowel obstruction, but other sequelae include female infertility and dyspareunia, and increased risk of visceral injury at any subsequent laparotomy or laparoscopy. Whether chronic abdominal pain is truly a consequence of adhesions is still a matter of some discussion, but it is likely to be accepted as an entity both by patients and by their legal advisors.

While there is currently a scarcity of published literature on the subject, a recent assessment of adhesion-related medico-legal claims dealt with by the British medical defence associations has been undertaken. Successful medico-legal claims include cases of bowel perforation after laparoscopic division of adhesions, delays in the diagnosis of adhesion obstruction of the small bowel, infertility as a result of adhesions and ‘pain’.

This problem is unlikely to be unique to the UK alone and general practitioners, surgeons and gynaecologists worldwide need to be aware of the increasing burden of medico-legal claims arising from the complications of intra-abdominal adhesions. Most importantly they need to consider whether it is now timely to take steps to avoid them.

1. Introduction
Adhesions and their associated complications are of rising medico-legal interest, particularly given that they are now considered the most frequent complication of abdominopelvic surgery. 1,2 To date, however, apart from our earlier reviews of the subject little has been published. 3,4 This review seeks to provide a timely and important update given recent calls for action and consensus position on adhesions and their prevention. 1,2

2. Adhesions a problem after all surgery
Post-operative adhesions are an almost invariable consequence of abdominal or pelvic surgery, no matter whether this is performed by the open or laparoscopic technique. An incidence of 93% was found in an analysis of relaparotomy patients 5 and while laparoscopic surgery has been considered to be less adhesiogenic, particularly in the development of de novo adhesions, 6-8 a meta-analysis revealed comparable results for open vs laparoscopic surgery. 9 The environment, pressure and duration of the pneumoperitoneum are all considered important, 10 as is the surgeon’s training. As Parker recently postulated, there is also a need to focus on planned surgery and, if secondary pathology is identified, to question the risk benefit of doing more than absolutely needed, as many of the traumas that cause adhesions are a routine part of surgery. 11

3. Adhesions and the risks of subsequent surgery
Adhesions make further surgery difficult for the surgeon and carry important morbidity and mortality risks for the patient – as well as increasing healthcare system costs. In abdominal laparotomy through a pre-existing scar, 39% of patients experienced major complications including bowel obstruction, anastomotic leak, wound dehiscence, sepsis and pneumonia, with an overall mortality risk of 8%. Even in the hands of experienced surgeons, there was a 19% risk of inadvertent enterotomy, with a significantly higher need for parenteral nutrition, ICU admission and longer hospital stay, as well as an associated mortality of 13%. 12 A 10–25% risk of bowel injury has similarly been estimated in laparoscopic adhesiolysis. 13

Epidemiological research has shown that over a third of patients following initial abdominopelvic laparotomy were readmitted at a mean of 2.1 times over 10 years for problems related to adhesions...
or other abdominopelvic surgery potentially complicated by adhesions. The consequential risk of adhesion-related problems in reoperative surgery is therefore considerable.

In many cases, adhesions remain symptomless throughout life – however, if only a small percentage of patients develop complications, this amounts to a large number. A 44% lifetime risk of abdominal surgery has been estimated in US patients coming to post-mortem.

Patients with adhesions have a lifetime risk of developing clinical complications of adhesions. The most important of these is small bowel obstruction (SBO) with serious morbidity as well as a 10% risk of mortality. The SCAR study of adhesion-related readmissions following general surgical or gynaecological laparotomy identified that 5.5% of readmissions were for surgical or non-operative treatment of SBO over the 10-year study period. This rose to 7.1% following colorectal surgery. Surgery on the colon, rectum, ovaries and Fallopian tubes were shown to present the greatest risk.

Further work by the SCAR study panel demonstrated that the comparative risk of adhesion-related complications following open and laparoscopic gynaecological surgery was similar. Additionally in colorectal surgery, the SCAR panel has investigated the comparative risk after specific procedures and demonstrated that panproctocolectomy, total colectomy and ileostomy surgery carry the highest risk of adhesion-related readmission.

Recent work by Duron and colleagues has shown that early post-operative mortality is strongly influenced by age and comorbidities but long-term mortality by post-operative complications which include inadvertent enterotomy.

Other important sequelae include female infertility and dyspareunia. Adhesions have also been identified as the most common pathology in 40% of cases of chronic pelvic pain (CPP) which is a major gynaecological problem and a difficult and costly disorder to treat. While there is mounting evidence for an association with CPP, whether this is a true consequence of the adhesions is still a matter of some debate, but it is likely to be accepted as an entity both by patients and by their legal advisors.

The consequences and complications of peritoneal adhesions have recently been comprehensively reviewed by Harry van Goor.

4. Adhesion-related medico-legal considerations

There is a rising concern in the UK at the cost of medico-legal claims in general with an estimated reserve of potential of cases against the UK National Health Service amounting to some £12 billion.

As adhesions are now considered the most frequent complication of abdominopelvic surgery they will likely also attract rising medico-legal interest. Possible medico-legal consequences of adhesions include:

- Failure to diagnose the problem
- Adhesive intestinal obstruction
- Inadvertent enterotomy at subsequent laparotomy or laparoscopy
- Chronic abdominal pain/dyspareunia
- Infertility
- Glove powder granulomas related to use of starch-powdered gloves
- Failure to use precautions to prevent adhesions

5. Adhesion-related claims

With the assistance of the Medical Protection Society (MPS) and the National Health Service Litigation Authority (NHSLA), we have assessed recent adhesion-related claims. The MPS was formed over 110 years ago and is a leading provider of comprehensive professional indemnity and expert advice with over 250,000 members worldwide. In the UK, it largely handles claims in the private medical sector and primary care. The NHSLA was formed in 1995 as a Special Health Authority (part of the National Health Service), responsible for handling negligence claims made against NHS bodies in England.

In 2007, the MPS opened 10,229 medical cases worldwide of which approximately 16% were clinical negligence claim-related matters. At the end of 2007, MPS had outstanding reported claims reserves of £346 m. In 2007, MPS paid £86.1 m in claim payment and settlement costs. During 2006–2007, the NHSLA handled a total of 5426 claims of various causes of clinical negligence in the UK, for which it paid out £579.3 million for damages paid to patients and the legal costs borne by the NHS.

As medico-legal adviser at the MPS, Dr Jane Cowan undertook a review of case files opened from 2001 onwards that had “adhesions” or similar key words in the case headline. The cases were initially either complaints or claims. While the key word searches will probably not pick up all relevant cases of adhesions, the review provides a useful snapshot with which to look at adhesion-related clinical negligence claims in the private sector in the UK.

Sixteen cases related to post-operative abdominal adhesions were found. There were four cases involving 5–16-year olds against general practitioners for failure/delay in diagnosis of appendicitis leading to peritonitis and subsequent formation/risk of adhesions. Only one of these cases was upheld; the three others were rejected. The remaining 12 cases were all adult female patients, at least five of which were as a result of adhesions from previous gynaecological surgery. Five of the complaints were against GPs for alleged delays in diagnosing problems (including intestinal obstruction) occurring as a result of adhesions. The remaining seven complaints were against surgeons. These cases comprised:

- Two cases of adhesions as a result of laparoscopic surgery complications:
  - Transection of the common bile duct
  - Bowel perforation
- One allegation of negligence:
  - Bladder perforated during adhesiolysis
- One allegation regarding the operative management of adhesions rather than the cause of them
- One case where adhesions were part of a wider complaint on surgical management
- One allegation against a surgeon some 21 years previously:
  - The medical notes were able to demonstrate that the technique employed was not negligent.
- One case related to post-operative complications following adhesiolysis:
  - 10 years of adhesions symptoms following gynaecological surgery led to the adhesiolysis operation.

Of these cases, only one was upheld with a small financial settlement made. The numbers and outcomes of claims against the MPS in the period 2001–2007 were not dissimilar to those previously reported in the period 1989–1999.

In the period 2001–2007, cases within the NHS were handled by the more recently formed NHSLA. The NHSLA database is used essentially for claims management purposes. There are acknowledged weaknesses, for example when a claim is closed the database is not always updated to show why the case was upheld. With the assistance of the NHSLA Risk Management team, an assessment of the claims related to adhesions was undertaken by searching free fields in their claims database for “adhesions” as a key element of
the claim. This may underestimate the incidence of adhesion-related problems in medico-legal claims. However, as with the findings from the MPS, it provides a useful snapshot. While the NHSLA advise that less than 4% of all claims they receive go to court, and most of those are because they relate to minors and so need court approval, the NHSLA as a Public body publish all their cost data and thus the data provided by them includes out of court as well as court settlements.

In the period 1995–2007, 79 claims were identified in which adhesions were mentioned. A review of these identified 67 that related to abdominopelvic adhesions. There were 41 claims in gynaecology and 26 in general surgery. Of the gynaecological claims, 33 have been closed with 19 successful claims made and eight cases remaining open. Amongst the general surgery claims, 24 have been closed with 10 successful claims. Two claims remain open.

Of the 41 gynaecology claims, 28 were related to injuries to related organs and structures and included three deaths (Table 1). Amongst the 41 gynaecological claims, five related to consent issues of which three resulted in successful claims. Four cases also resulted in infertility of which two were successful with two currently open.

Amongst the 26 general surgery claims 12 related to injuries to organs and structures and also included three deaths (Table 2). Eleven of these have been settled, seven successfully with only one remaining open. There were nine claims that involved issues relating to delay in diagnosis/treatment, one including a death, and four cases that involved consent issues.

Of the 57 closed claims the 29 successful claims resulted in a settlement of over £3.3 million (Table 3). Noting recent concerns about the size of the NHSLA legal bills,26 lawyers’ costs alone

Table 1

<table>
<thead>
<tr>
<th>Gynaecological injury</th>
<th>Open case</th>
<th>Successful claim</th>
<th>Unsuccessful claim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional/unnecessary operation</td>
<td>0</td>
<td>1(^a)</td>
<td>2(^b)</td>
</tr>
<tr>
<td>Bowel damage/dysfunction/perforation</td>
<td>5</td>
<td>5(^c)</td>
<td>4</td>
</tr>
<tr>
<td>Bladder damage</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Incontinence</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Failed sterilization/wrongful birth</td>
<td>0</td>
<td>2(^b)</td>
<td>0</td>
</tr>
<tr>
<td>Fatality</td>
<td>0</td>
<td>2(^d)</td>
<td>0</td>
</tr>
<tr>
<td>Fistula</td>
<td>0</td>
<td>2(^e)</td>
<td>0</td>
</tr>
<tr>
<td>Infertility</td>
<td>2</td>
<td>2(^f)</td>
<td>0</td>
</tr>
<tr>
<td>Loss of kidney</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Nerve damage</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Other infection</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Scarring</td>
<td>0</td>
<td>1(^i)</td>
<td>0</td>
</tr>
<tr>
<td>Unnecessary pain</td>
<td>0</td>
<td>1(^j)</td>
<td>4(^l)</td>
</tr>
<tr>
<td>Psychiatric/psychological damage</td>
<td>1(^b)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^a\) Included removal wrong organ.
\(^b\) Included one with severed artery and a consent issue.
\(^c\) Included one death.
\(^d\) Both involved bowel perforations.
\(^e\) One included bowel perforation.
\(^f\) Including one with bowel perforation.
\(^g\) Including one with ureter damage.
\(^h\) Involved bowel injury.
\(^i\) One involved consent issue.
\(^j\) Included consent issues.
\(^k\) One included consent issue.
\(^l\) One included consent issue.

Table 2

<table>
<thead>
<tr>
<th>General surgery injury</th>
<th>Open case</th>
<th>Successful claim</th>
<th>Unsuccessful claim</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional/unnecessary operation</td>
<td>1(^a)</td>
<td>3(^d)</td>
<td>5(^e)</td>
</tr>
<tr>
<td>Bladder damage</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Bowel damage/dysfunction/perforation</td>
<td>0</td>
<td>3</td>
<td>2(^f)</td>
</tr>
<tr>
<td>Fatality</td>
<td>0</td>
<td>2(^g)</td>
<td>1(^i)</td>
</tr>
<tr>
<td>Hemiparesis</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Liver damage</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other infection</td>
<td>0</td>
<td>1(^j)</td>
<td>0</td>
</tr>
<tr>
<td>Unnecessary pain</td>
<td>0</td>
<td>1(^k)</td>
<td>4(^l)</td>
</tr>
</tbody>
</table>

\(^a\) Included consent issue.
\(^b\) Two involved delay in diagnosis.
\(^c\) One included consent issue.
\(^d\) Three involved delay in diagnosis.
\(^e\) One included consent issue.
\(^f\) One involved delay in diagnosis.
\(^g\) One included injury to iliac artery.
\(^h\) One included bowel injury.
\(^i\) Included delay in diagnosis.
\(^j\) Included bowel injury and consent issue.
\(^k\) Included injury to common side duct.
\(^l\) Included one delay in diagnosis.
General complications of laparoscopic surgery (gynaecological)

Anastomotic leak (colorectal) 1:12

Damage, the NHSLA issued formal guidance which identified a level case, in which a patient was not warned of the risk of neurological potential negligence claims if problems then ensue.

During the consent process could be putting themselves at risk of negligence to be established. The Health Act 1999 also now establishes that all clinicians have a Duty of Quality.

To establish negligence, the claimant has to establish:

- There is a duty of care
- There has been a breach in the duty of care
- This breach caused the injury.

All three aspects need to be present and demonstrated for negligence to be established. The Health Act 1999 also now establishes that all clinicians have a Duty of Quality.

In terms of negligence, a doctor’s duty of care includes giving careful advice and sufficient information, upon which the patient could then reach a decision as to whether to accept or refuse treatment. In negligence cases, patients often claim that insufficient information was provided and that, if it had been provided, consent would not have been granted. While for many years the Bolam test of negligence had been used as the precedent in determining negligence, recently judgements are more likely to be made in favour of what reasonable patients might expect from what reasonable doctors might do. As a result of the Chester vs Afshar case, in which a patient was not warned of the risk of neurological damage, the NHSLA issued formal guidance which identified a level of 1–2% as being the limit above which failure of notification could be deemed to be negligent.

What is usually overlooked by surgeons is that the risk of adhesions has now been clearly demonstrated to be above this 2% risk threshold and, indeed, above the risks of many other problems that are already routinely discussed as part of the consent process (Table 4).

Therefore, surgeons who do not mention adhesions during the consent process could be putting themselves at risk of potential negligence claims if problems then ensue.

7. Reducing the risk of adhesions

Given the amount of evidence of the risk of adhesions and increasing evidence that adopting adhesion-reduction strategies is likely to reduce this risk, surgeons need to:

- Be aware of the risk of obstruction at any time up to many years following open or laparoscopic surgery on the abdomen or pelvis. A pre-existing scar on the abdomen is a good indicator.
- Be aware of the risk of delay in diagnosis in such cases.
- Be aware that there is a high risk of visceral damage at laparotomy or laparoscopy if they perform adhesiolysis.
- Be aware there is also a high risk of inadvertent organ damage if they have to reoperate for any reason on a patient with a record of previous surgery or simply evidence of a surgical scar on the abdomen.
- Consider that, while the causal relationship of adhesions and pelvic pain may still be debated in some sectors, if complaints arise, then lawyers tend to side with the patient.
- Take all reasonable precautions:
  - Explain the potential risk of adhesions as part of the consent process
  - Adopt the principles of microsurgical/gentle/surgery
  - Consider the use of anti-adhesion therapy at least in high-risk surgery.

All these principles are largely common sense, particularly given the volume of evidence on adhesions and their complications. Importantly they are simple and specific principles now enshrined in law.

### Table 4

<table>
<thead>
<tr>
<th>Complications of general anaesthetic</th>
<th>&lt;1:100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damage to colon at colonoscopy</td>
<td>1:500</td>
</tr>
<tr>
<td>Chronic pain after inguinal hernia repair</td>
<td>1:8–1:3</td>
</tr>
<tr>
<td>Sexual dysfunction after ileo-anal pouch surgery</td>
<td>1:28</td>
</tr>
<tr>
<td>Anastomotic leak (colorectal)</td>
<td>1:12</td>
</tr>
<tr>
<td>General complications of laparoscopic surgery (gynaecological)</td>
<td>1:1000</td>
</tr>
<tr>
<td>Sterilisations</td>
<td>1:500</td>
</tr>
<tr>
<td>Other procedures</td>
<td></td>
</tr>
<tr>
<td><strong>Directly adhesion-related readmissions</strong></td>
<td><strong>1:17–1:10</strong></td>
</tr>
</tbody>
</table>

Table 5

<table>
<thead>
<tr>
<th>Published principles of good adhesion practice</th>
</tr>
</thead>
<tbody>
<tr>
<td>In an increasingly litigious culture, surgeons should be aware of the medico-legal consequences of adhesions</td>
</tr>
<tr>
<td>- Including damage to reputation, career and professional embarrassment</td>
</tr>
<tr>
<td>- Recognise that adhesions are the most frequent complication of abdominal surgery</td>
</tr>
<tr>
<td>- Adhesions as a complication of surgery should be discussed with patients prior to surgery</td>
</tr>
<tr>
<td>- Those who have had previous abdominal surgery are at a higher risk of adhesion-related complications</td>
</tr>
<tr>
<td>- Certain procedures carry significant risk</td>
</tr>
<tr>
<td>- Fulfil duty of care to protect patients by providing the best possible standards of care</td>
</tr>
<tr>
<td>- Includes taking steps to reduce adhesion formation</td>
</tr>
<tr>
<td>- Adopt a routine adhesion-reduction strategy at least in surgery at high risk</td>
</tr>
<tr>
<td>- Good surgical technique is fundamental to any adhesion reduction strategy</td>
</tr>
<tr>
<td>- Consider use of adhesion-reduction agents as part of an adhesion-reduction strategy</td>
</tr>
<tr>
<td>- Agents with data to support safety in routine surgery and efficacy in reducing adhesions</td>
</tr>
<tr>
<td>- Practicality and ease of use of agents plus cost will influence acceptability in routine practice</td>
</tr>
<tr>
<td>- Progress further research to understand the impact that adhesion reduction agents have on clinical outcomes</td>
</tr>
<tr>
<td>- Encourage research towards more effective preventative agents</td>
</tr>
<tr>
<td>- Including use of combinations of agents to prevent formation of de novo adhesions as well as adhesion reformation</td>
</tr>
<tr>
<td>- Surgeons need to act now to reduce adhesions and fulfil their duty of care to patients</td>
</tr>
</tbody>
</table>
in the consensus position of the European Society of Gynaecological Endoscopy and in a ‘call for action’ from a group of colorectal surgeons known for their interest and expertise in adhesions and their consequences.\(^2, 3\) It is therefore probably wise to follow the principles detailed in Table 5 not only to avoid the risk of medico-legal claims but, most importantly, to provide the best chance of improving patients’ outcomes.

**Authorship**

Both HE and AC were wholly involved in the review of the medico-legal data and the preparation and writing of this review, and have both agreed this manuscript.

**Conflict of interest**

HE has been involved in research on adhesions for some 50 years from commencing study on the aetiology of adhesions in the rat which led to publication of his DM thesis in 1961. In the proceeding years HE has received support for research and has been involved in a host of collaborative projects and publications, and provided consultancy to many organisations and most companies with a research or commercial interest in adhesions, as well as being an expert witness on adhesions in a number of medico-legal cases. AC Corvus has worked in the field of adhesions for some 15 years in both the facilitation and coordination of research, education and communication projects, working with many specialists and organisations involved in post-operative adhesions. Corvus has received funding from a variety of companies with a research or commercial interest in adhesions including Genzyme, Vectura, Shire, Baxter and FizioMed. Neither author holds any stock holding or other interest in any company involved in adhesions. In the context of the work presented in this manuscript and in consideration of the IJS guidance on competing interests, neither author has a conflict or competing interest in relation to this publication.

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Baxter BioSurgery provided assistance in obtaining the data update from the MPS and NHSLSA for HE and AC to review in the context of current evidence and recommendations on adhesions and thus update on HE earlier papers. As sponsors, Baxter reviewed and commented on the manuscript – as did the MPS and NHSLSA – but the decision to act on all comments received and to submit the manuscript rested solely with the authors.

**Ethical approval**

None declared.

**Acknowledgments**

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**References**
