

# Timing of return to work after hernia repair: Recommendations based on a literature review

A patient's occupational duties and individual pain experience should both be considered when recommending how soon to resume regular activities following surgery.

**ABSTRACT:** Inguinal hernia repair is the most common elective surgery performed by general surgeons. The duration of convalescence has been controversial and poorly studied. Previous recommendations have been based on retrospective, observational studies and largely on tradition. In this study, a review of the biomechanical studies on recovery from hernia surgery was undertaken. Based on this review individually tailored recommendations were made considering each patient's usual vocational activity rather than a one-size-fits-all approach.

Inguinal hernia repair is one of the most common procedures performed by the general surgeon. In the United States alone, approximately 750 000 inguinal, 25 000 femoral, and 166 000 umbilical herniorrhaphies are performed each year.<sup>1</sup> While research historically has focused on ways to minimize recurrence rates, endpoints for many recent studies have involved quality of life following repair—particularly in relation to postoperative pain and return to work or athletic activities. This new focus comes as a result of technological innovations and an increasing awareness of socioeconomic factors. The development of mesh repairs and the introduction of laparoscopic techniques have affected recurrence rates and made the return to usual activities faster.<sup>2</sup> The optimal duration of convalescence has thus been a topic of debate in British Columbia, where WorkSafeBC and the BCMA Section of General Surgery recently agreed that an impartial review of the evidence was needed to determine the best timing of return to work.<sup>3</sup> Our review of the clinical and biomechanical literature is summarized here and accompanied by practical evidence-based recommendations that can be tailored to the specific needs of individual patients.

## Influence of surgeon and physician recommendations on timing of return to work

In a seminal 1890 publication on the suture repair of inguinal hernia, Bassini recommended 6 weeks of bed rest followed by an extended period of convalescence.<sup>4</sup> This advice remained the standard of care throughout the 1940s. Hernia repairs were often performed by unsupervised trainees and a high recurrence rate was common. Strict bed rest of 3 weeks followed by a convalescence of 9 weeks was commonly prescribed in the hopes of lowering recurrence rates.<sup>5</sup> It was not until the 1960s that researchers determined that a wound closed with modern non-absorbable sutures had 70% of the strength of intact tissue at the completion of the operation.<sup>6</sup> This finding subsequently provided surgeons with the physiological basis to permit

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return to activity immediately after surgery,<sup>7</sup> and has increasingly led to early mobilization of surgical patients, even after major abdominal surgery.<sup>8</sup> However, because recurrence is a concern after hernia repair, the practice of recommending extended convalescence has persisted despite research demonstrating that early return to activity has no detrimental effect.<sup>9-11</sup>

### **The practice of recommending extended convalescence has persisted despite research demonstrating that early return to activity has no detrimental effect.**

In the modern era of mesh hernia repair, recurrence rates are significantly lower and the need for lengthy convalescence has been challenged. Several publications have looked at the influence of care provider attitudes on return to work after hernia repair. A 1993 survey conducted in the United Kingdom found that whereas surgeons recommended taking an average of 4.4 weeks off work after surgery, general practitioners recommended 6.2 weeks and patients actually took an average of 7.0 weeks off.<sup>12</sup> Research has also found that those with physically strenuous jobs are significantly slower to resume work after hernia repair.<sup>12,13</sup> Descriptive studies suggest that both surgeons and GPs tend to recommend a longer period of convalescence for patients who are in physically demanding jobs, with 97.5% of physicians stating that occupation should have a direct influence on the

duration of convalescence.<sup>12,13</sup> A patient's employment status may also have a bearing on the timing of return to work. Self-employed patients are found to return to work faster than those receiving disability benefits.<sup>9</sup>

Various studies have considered the role of patient motivation and physician advice on the timing of a return to normal activities. Tolver and colleagues reported that preoperative expectation of time off work was the only significant factor in prolonged convalescence.<sup>14</sup> Furthermore, having a predetermined duration of convalescence was a dominant self-reported reason, along with pain and fatigue, for not resuming normal activities during the first 3 days after surgery. This parallels studies on return to work after laparoscopic cholecystectomy, where preoperative expectation of time off was also the only independent factor identified.<sup>15</sup>

Very few studies have focused on efforts to expedite return to activity by encouraging patients to expect a shorter convalescence. In a small series of 100 patients undergoing elective open hernia repair, Callesen and colleagues found that when the surgeon recommended only 1 day off work, the median absence from activity was 6 days for those with light-duty occupations and 25 days for those with more physically demanding occupations.<sup>16</sup> In 2004 a larger prospective, multicentre, nonrandomized study of over 1000 patients sought to investigate the consequences of a surgeon-recommended 1-day convalescence on recurrence and return-to-work rates. The median time off work in this study was 7 days (extended to 14 days for patients in the most strenuous occupations), with no increase in recurrence.<sup>17</sup> Of patients who had not returned to work by postoperative day 7, 64% cited pain and 17% cited wound complication as the reason.

### **Lessons from the experience of high-performance athletes**

An interesting parallel can be drawn between recovery from hernia repair and recovery from abdominal muscular strain and tear injuries experienced by high-performance athletes. Conte and colleagues found that Major League Baseball players with internal/external oblique muscular strains required an average of 27 days before they could resume physical activity related to baseball.<sup>18</sup> In a study of tennis players, Maquirriain and colleagues found that a 5-week period of convalescence was needed before sporting activity could be fully resumed, and they strongly recommended a gradual return to play through a practical, sport-specific rehabilitation process.<sup>19</sup> Woodward and colleagues advocated strongly for a gradual increase in abdominal loading for National Hockey League (NHL) players with groin injuries through three phases of physiotherapy with progression dependent on the player's ability to complete each phase with minimal pain.<sup>20</sup> Emery and colleagues showed that NHL players with abdominal wall injuries required an average of 6 to 8 weeks to return to full activity.<sup>21</sup>

Comparing hernias to sports injuries is not intended to be specious. Open inguinal hernia repair requires making a surgical tear in the groin to access the floor of the inguinal canal, and the patient must then not only experience healing around the mesh and the floor of the inguinal canal, but also of the surgically created abdominal wall tear. It follows that a process and duration of convalescence similar to that needed for sports injuries should be expected for hernia repair.

### **Influence of postoperative pain on return to work**

The timing of return to activity after hernia repair can be affected by postoperative pain. While the patient may

be able to resume work with minimal fear of recurrence, significant inguino-dynia may prevent this, as shown in the literature already cited. A possible factor in the variable incidence of postoperative pain may be the type of repair employed. In a randomized trial published in the *Lancet*, the Medical Research Council of Great Britain noted a 37% incidence rate for residual pain after open repair compared with a 27% incidence rate following laparoscopic hernia repair.<sup>22</sup> When Koninger and colleagues looked more specifically at postoperative pain that resulted in functional limitation, they found open suture (Shouldice) and open mesh (Lichtenstein) repairs were associated with a higher level of pain-related postoperative activity limitation compared with laparoscopic techniques (13% to 15% vs 2.4%).<sup>23</sup> While the type of repair appears to have an effect, no association has been found between pain and the type of hernia, the defect size, the length of the incision, the experience of the operating team, or operating time.<sup>24</sup>

### Biomechanical considerations

The convalescence period after mesh repair involves two phases, whether an open or laparoscopic technique is used. During the first phase, the mesh remains fixed in position only by the strength of sutures or tacks. During the second phase, tissue ingrowth occurs and imparts lasting stability to the mesh. The length of time it takes for tissue ingrowth and the amount of force required to cause a failure of the mesh repair are the critical factors to be assessed in the biomechanical strength of the repair. Less force is needed to tear a suture free or displace a fixation tack and cause a failure of the hernia repair in the first convalescence phase than in the second phase. Therefore, any discussion of return to

**Table 1. Intra-abdominal pressure and tensile force resulting from specific activities.**

Activity	Intra-abdominal pressure	Tensile force
Lying supine	2–4 mm Hg	0 N/cm
Standing, sitting	15–20 mm Hg	5 N/cm
Squat maneuver, valsalva maneuver	30–40 mm Hg	10 N/cm
Lifting 10 kg	50–60 mm Hg	15 N/cm*
Lifting 20 kg	70–80 mm Hg	20 N/cm
Coughing	100 mm Hg	25 N/cm
Jumping	170 mm Hg	50 N/cm

\*The amount of force that could cause a hernia repair failure before 6 weeks

work must take into consideration how much ingrowth will have occurred and the amount of force that would be exerted on the repair during the patient’s normal occupational duties.

A biomechanical analysis has shown that mesh dislocation occurs commonly with nonfixation technique because of mesh migration prior to tissue ingrowth.<sup>25</sup> Regardless of the cause, failure of mesh fixation can lead to repair failure. The amount of force needed to peel the mesh from the tissue in a porcine model was found to be significantly greater at 12 weeks than at 2 weeks, and if the force needed to peel the mesh at 12 weeks was rated at 100%, the force needed at 6 weeks was 78%.<sup>26</sup>

The maximum tensile strength of cadaveric abdominal walls is 15 N/cm.<sup>27</sup> This approximates the force it takes to displace a fixation tack or cause a suture to tear free in the first phase of convalescence. Most mesh materials can withstand a tensile force of 16 to 32 N/cm.<sup>28</sup> Lightweight and heavyweight polypropylene meshes have similar burst-strength biomechanical properties after tissue ingrowth is complete.<sup>29</sup>

The conversion of intra-abdominal pressure into tensile force has been studied using a human cadaveric mod-

el.<sup>30</sup> In this study, intra-abdominal pressure of 20 mm Hg (25 mbar) generated a tensile force of 5 N/cm, 40 mm Hg (50 mbar) generated 10 N/cm, 55 mm Hg (75 mbar) generated 15 N/cm, and 75 mm Hg (100 mbar) generated 20 N/cm of tensile force.

Resting intra-abdominal pressure is 2 to 4 mm Hg and can increase with varying degrees depending on activity. For example, jumping creates an intra-abdominal pressure of 170 mm Hg, coughing 100 mm Hg, the valsalva maneuver 40 mm Hg, and standing 20 mm Hg.<sup>31</sup> Performing a squat without added weight can generate an intra-abdominal pressure of 35 mm Hg. Adding a 5-kg load increases this to 45 mm Hg. Lifting 10 kg generates 50 mm Hg of intra-abdominal pressure and lifting 15 kg generates 65 mm Hg.<sup>32</sup>

Based on these biomechanical studies, the first phase of convalescence lasts for approximately 6 weeks, until the tensile strength provided by tissue ingrowth into the mesh reaches approximately 80%.<sup>26</sup> In this first phase the amount of force needed to displace the mesh is 15 N/cm, which can be generated by lifting more than 10 kg or by other activities such as coughing or jumping. See **Table 1** for a summary of the pressure and force associated with various activities.

**Table 2. Recommendations for timing of return to work after hernia surgery.**

Occupation	Timing of return to work
Little or no lifting involved	1–2 weeks after surgery
Moderate lifting < 10 kg	2–4 weeks after surgery
Heavy lifting > 10 kg	6–8 weeks after surgery

### Conclusions

The adoption of new technologies and techniques has challenged the practice of recommending a prolonged period of convalescence after hernia repair. However, it is clear from the sports medicine literature and biomechanical studies that recommendations must be patient-centred and take into consideration both regular work activities and individual pain experience. Tensile forces sufficient to cause an early repair failure can be generated by lifting more than 10 kg, and this risk persists up until 6 weeks after surgery. All patients should avoid coughing and strenuous activities such as jumping in this period.

Provided the surgery is uncomplicated and the patient does not need to lift more than 10 kg at work, it appears safe to encourage a return to work soon after surgery. Patients should be encouraged to resume their vocational and recreational activities as soon as they feel comfortable. If the patient's work requires little or no lifting, pain is the main limiting factor and returning to work after 1 or 2 weeks is reasonable, especially if a laparoscopic technique was employed. If the patient's work requires moderate lifting up to 10 kg, the biomechanical studies support 2 to 4 weeks of convalescence. For patients needing to lift more than 10 kg, or perform other activities that

generate a prolonged intra-abdominal pressure of 50 to 60 mm Hg or more, the evidence supports 6 to 8 weeks of convalescence.

Medicine is both a science and an art. We have reviewed the best available scientific evidence, but the effect on convalescence of individual factors such as age, smoking habits, alcoholism, diabetes, renal failure, obesity, COPD, and other comorbidities remains unclear. Accordingly, the recommendations in **Table 2** should be considered guidelines that function best as an adjunct to the physician's judgment of when a particular patient might be ready to return to work. The art of medicine—as practised by the attending physician—remains paramount when integrating the best available evidence with an appreciation of individual needs in order to achieve the goal of true patient-centred care.

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### Competing interests

None declared.

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