Persistent Post Surgical Pain is a chronic pain condition resulting from surgery. Although largely unrecognised in the past, there is more awareness of the problem recently. It is thought that between 10-50% of individuals can develop persistent post surgical pain after common operations such as groin hernia repair, breast and thoracic surgery, leg amputation, and coronary artery bypass surgery.\(^1\) It is a consequence of neuropathic pain as a result of injury to major peripheral nerves although very rarely it could be due to ongoing inflammation. Table 1 shows the prevalence of chronic pain following surgery.


Activation of nociceptors in the immediate postoperative period leads to an inflammatory response and this “nociceptive” pain usually responds to nonsteroidals and anti-inflammatory analgesics. If however as a result of nerve injury, a neuropathic pain were to develop, this would persist in the absence of ongoing inflammation and be resistant to conventional analgesics. It is therefore important to differentiate neuropathic pain from non-neuropathic pain in order to be able to have effective strategies to prevent and treat this condition. The degree of nerve damage correlates with the intensity of chronic pain as shown in changes in sensory threshold and somatosensory evoked responses to electrical stimulation in the thoracotomy scar area.\(^2\)

**Risk factors**
Risk factors for developing persistent post surgical pain have been identified and have been classified into blue, yellow and red flags. The blue flags are perioperative risk factors, yellow flags the psychological and environmental factors and red flags the postoperative physical disorders.

**Blue flags**
- Pre-existing chronic pain
- Younger age
- Female sex
- Site and extent of surgery
- Pain before surgery

Previous pain correlates with the development of chronic neuropathic pain. Severe post herpetic neuralgia is often preceded by severe zoster pain.\(^3,4\) Amputees with severe phantom limb pain have more often had intense and enduring preamputation pain than amputees with less intense phantom pain.\(^5,6\) Uncontrolled acute postoperative pain also predisposes to subsequent chronic post surgical pain. Younger age predisposes to developing persistent post surgical pain. In postherniorrhaphy pain older patients have a reduced risk of developing chronic pain.\(^7,8\) Other factors such as site and extent of surgery and re-operations are thought to predispose to developing persistent postsurgical pain.

**Yellow flags**
Psychological factors
- Emotions
- Perceptions
- Past experiences
Attitudes and concerns and beliefs
Preop anxiety

Environmental factors
Low self rated esteem
Income
Level of education
Relationship issues (divorced/separated)

Expectation of pain, fear, past memories, social environment, work and levels of physical activity, all affect the response to noxious stimuli. Preoperative anxiety is correlated with postoperative pain experience.

Genetic susceptibility
Genetic susceptibility may explain the reason why only a proportion of patients with intraoperative nerve damage develop chronic pain. It is thought that there is a differential heritable susceptibility both to the generation and experience of pain, as well as to the response to analgesics. Results of studies in rodents indicate that the susceptibility to develop neuropathic pain has a strong heritable component, but the genes responsible have yet to be identified.

Red flags
Infection
Bleeding
Organ rupture
Compartment syndrome
Postoperative physical factors stated above will predispose to a higher incidence of developing persistent post surgical pain.

Predicting persistent post surgical pain
Scoring systems based on age, sex, type of surgery, level of preoperative anxiety have been developed to attempt to predict early postoperative pain.

Preoperative nociceptive stimulation tests have also been used either using a heat stimulus before knee surgery or an ice water test in patients undergoing laparoscopic cholecystectomy and a positive correlation noted between preoperative pain response and degree of early postoperative pain. These preoperative tests can be used to identify those patients who are likely to develop early postoperative pain and hence can be used to predict the risk of developing persistent post surgical pain. Preoperative catastrophising is known to be correlated with the intensity of acute postoperative pain.

If such patients can be identified, measures can be taken to try and prevent the development of persistent post surgical pain.

Prevention

Preoperative assessment
The preanaesthetic assessment and consultation helps to allay anxiety and fears about surgery and anaesthesia. The anaesthetist during the preoperative visit should discuss analgesic regimes, recovery and postoperative pain relief and reassure the patient. Assurance from the anaesthetist is thought to contribute to a better recovery.

Surgical technique
Minimising damage to major peripheral nerves is important and therefore minimally invasive techniques have shown to reduce the risk of developing chronic pain. It has been shown that laparoscopic herniorrhaphy reduces the risk of nerve damage and pain compared with open surgery. The use of light weight mesh for inguinal hernia repair is supposed to reduce the inflammatory response and so reduce the risk of post op pain. Thoracoscopic techniques that reduce damage to intercostal nerves have been shown to be superior than open surgery.

Education and effective analgesia
Education of the medical and nursing staff about the importance of managing pain in the immediate postoperative period is of utmost importance. Results from a UK based national survey showed that pain continues to be undermanaged and that 80% of postoperative patients still experience pain and of this 86% reported their pain to be moderate or severe. If pain is to be treated adequately it has to be measured and for this reason, it has been suggested pain to be considered as the “fifth vital sign” alongside with heart rate, blood pressure, temperature and respiratory rate. Aggressive pain management in the acute postoperative period is important but whether techniques such as preemptive or preventive analgesia producing a meaningful reduction in chronic pain is unclear. Multimodal approaches using
ketamine\textsuperscript{31} and other N-methyl-d-aspartate receptor antagonists as well as antineuropathic medications such as gabapentin and pregabalin\textsuperscript{32} in the perioperative period have the potential to prevent central neuroplasticity and need further investigation.

**Conclusion**
Prevention of Persistent Post Surgical Pain depends on awareness amongst surgeons about using minimally invasive surgical techniques, careful preoperative preparation of patients and optimal anaesthetic and pain management in the perioperative period. Identifying those at possible risk of developing postoperative chronic pain and managing them is also very important. More recently, Persistent Post Surgical Pain has been described as a neurodegenerative disorder that requires neuroprotective treatment.\textsuperscript{1} This would involve modalities aimed at reducing the neuroplastic changes that occur within the nervous system with time and just controlling pain alone in the perioperative period may not be adequate.

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