Interventional procedures in the management of cancer pain

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Introduction
With increasing understanding of the management of cancer pain its control has improved considerably, although even with good use of the WHO opioid ladder and other pharmacological interventions, up to 5-14% of patients do not have their pain adequately controlled. As a result of this, it has been suggested that a fourth step should be added to the three-step WHO opioid ladder, that of interventional procedures and spinal drug delivery. This article provides a necessarily brief introduction to some of these procedures, focusing particularly on those involving image guidance: these procedures are discussed in more detail in other publications.

Introduction

Interruption of pain transmission
In the past a large number of different elements of the pain pathway have been submitted to destructive lesioning in an attempt to alleviate cancer and other pains, ranging from destruction of peripheral nerves to sectioning of the spinal cord and even intracranial surgery. Because of increased expertise in spinal analgesic drug administration, such destructive approaches are less common now, though there is still a place for procedures to some peripheral nerves, including intercostal nerves for rib and other chest wall metastases. Temporary blockade may be using local anaesthetic with or without depot steroid. In some circumstances temporary blockade may give very prolonged therapeutic benefit – the mechanisms behind this may be the reduction by locally applied steroid of abnormal activity in damaged or compressed nerves, or resetting central nervous system (CNS) ‘vicious cycles’ of sensitisation that lead to maintenance of pain. Blockade can be extended using implanted catheters in other sites such as major nerve plexi, the interpleural space and other areas.

More permanent blockade of nerves can be performed using cold (cryotheraphy) or heat (radiofrequency lesioning) or by the injection of chemicals including phenol or alcohol that destroy nerve tissue.

A common and difficult to control pain is incident pain from vertebral metastases. Local anaesthetic and steroid paravertebral or epidural blocks may prove useful in aiding in the management of this pain (figure 1).

Sensory nerves conveying pain enter the spinal cord via the dorsal nerve roots and the dorsal horn. Intrathecal neurolysis may be performed to target this area; hyperbaric phenol in glycerol may be injected with the patient in a semisupine position with the affected side downwards to attempt to give selective effect at the ipsilateral dorsal root and dorsal horn. An alternative, for perineal tumour pain, may be injection with the patient in the sitting position to provide analgesia of the sacral nerve roots.

Following nerve entry into the dorsal horn, and decussation of the pathways to the contralateral side, transmission continues proximally in the anterolateral spinothalamic tract. Percutaneous cervical cordotomy may be performed to target this tract, this procedure being appropriate to aid in the management of unilateral pain below the dermatomal level of C5 in patients whose survival is likely to be less than six months to a year. This procedure is particularly pertinent for conditions such as mesothelioma (figure 2).

A needle electrode is inserted into the spinothalamic tract in the cervical cord contralateral to the pain laterally at the C1-C2 interspace. The needle is passed into the cerebrospinal fluid (CSF) and contrast medium is injected to outline the anterior cord surface and dentate ligament and then the needle is advanced into the cord just anterior to the dentate ligament, with impedance measurement to indicate when the cord is entered. Electrical stimulation is used to confirm correct placement within the tract and that the needle is not in the motor tracts, and then localised radiofrequency lesioning is performed. This procedure offers an efficacy up to 95%, sustained in 69% at the end of life. It is a valuable procedure, but has limited availability in many parts of the UK.
Sympathetic blocks
Visceral cancer pain, from the gut, intra thoracic, abdominal and pelvic organs, is largely transmitted by pathways along the sympathetic chain, the nerves passing into the central nervous system without synapse. Pain from the upper gut (down to the mid transverse colon) is conveyed via the coeliac plexus; that from the lower bowel and pelvic organs via the hypogastric plexus and lumbar sympathetic chain, culminating in the unpaired ganglion impar just anterior to the sacrococcygeal junction, carrying afferents from the lower rectum. These pathways may be interrupted to alleviate pain arising from the innervated viscera.2,6

Coeliac plexus block is the neurolytic sympathetic block most commonly used for malignant pain, and that for which there is the strongest evidence. The coeliac plexus transmits afferents from the pancreas, liver and biliary tract, upper renal tract and bowel down to the mid transverse colon.

The greater, lesser and least splanchnic nerves pass anteriorly through the crura of the diaphragm to form the coeliac plexus which lies retroperitoneally anterior to the aorta around the origin of the coeliac artery. The plexus is classically approached posteriorly, with the patient prone, with needles inserted to pass lateral to the body of L1 to lie anterolaterally to the aorta, though deliberate transaortic positioning has been reported. Once good positioning has been confirmed by injection of contrast medium, which may be seen transmitting aortic pulsations on image intensification, alcohol is injected to provide neurolysis of the plexus (figure 3).

Other approaches that may be used include anteriorly with CT or MRI guidance, or under endoscopic ultrasound guidance. As an alternative, the splanchnic nerves, retrocrurally, may be interrupted by chemical agents or radiofrequency lesioning.

For pain arising from the lower gut, bladder and other pelvic viscera, other approaches to the sympathetic chain used include superior hypogastric plexus block and lumbar sympathetic block; ganglion impar block may be used for low rectal pain. These procedures are discussed further elsewhere.2,6 Lumbar sympathetic block also may be used for improvement of peripheral perfusion in small vessel ischaemic disease (figure 4).

Other procedures
As other parts of the multimodal management of cancer pain, radiotherapy and chemotherapy have important roles, although these are outside the remit of this article.

A number of other interventional procedures may be of use in malignant pain. Many patients have a substantial component of muscular (myofascial) pain which may benefit from trigger point injections. Metastases have been successfully treated with radiofrequency thermal lesioning, as well as bony augmentation procedures such as vertebroplasty or kyphoplasty; injection of metastases either with local anaesthetic and steroid or neurolytic agents may be beneficial, as well as joint injections where there is tumour involvement, as shown in figure 5.

Conclusion
Although interventional procedures are less commonly used nowadays for pain management, they retain a useful place in cancer pain and those managing such patients with cancer pain should remain aware of their potential.

References

FIGURE 1
Paravertebral block.

FIGURE 2
Percutaneous cervical cordotomy.

FIGURE 3
Coeliac plexus block.
**FIGURE 4**
Lumbar sympathetic block.

**FIGURE 5**
Hip block with adjacent tumour: Combined with injection of pathological fracture area relieved pain.