**The Role of ketamine in modern acute pain management**

**Dr Gillian Chumbley**

Ketamine was originally synthesized in the 1960’s as an anaesthetic agent and was first given to American Soldiers in the Vietnam War. It is useful in battlefield situations, as it produces anaesthesia without loss of respiratory drive, thereby avoiding the need for ventilation. It also preserves sympathetic reflexes, which helps to maintain blood pressure in patients who may have lost blood [1].

Over fifty years later ketamine is still used as an anaesthetic agent, but in addition it is used in low, subanaesthetic doses for its analgesic properties. Ketamine interacts with a number of receptors and channels and the analgesic effect is due to the antagonism of the N-methyl-D-aspartate (NMDA) receptor [2], which is thought to be responsible for central sensitization, the mechanism by which acute pain becomes persistent or chronic [3,4].

In normal pain transmission, the NMDA receptors in the dorsal horn of the spinal cord are inactive and are plugged by magnesium ions. But when the dorsal horn is bombarded by pain signals and there is intense activity in the synapse, the NMDA receptors become active. This may occur when pain is uncontrolled after surgery, during trauma or when nerves have been injured. Activation of this receptor causes a considerable influx of calcium into the spinal nerve, which causes massive neuronal depolarisation and increases the level of excitability of this nerve [5]. Central sensitization changes the way that the nerves deal with subsequent painful stimuli [6]. Central sensitization shows itself by enlarging the sensitive area of the skin that causes pain stimulation and can also produces the symptoms of allodynia and hyperalgesia [7].

Since 1998 acute pain services have become more aware of the potential for patients to develop chronic pain after surgery [8] and uncontrolled post-operative pain has been identified as a risk factor [7,9]. There have been various systematic reviews supporting the use of ketamine in controlling pain after surgery [10,11,12,13]. These reviews have shown that ketamine reduces pain intensity and opioid consumption.

This presentation will discuss the ways that ketamine can be used for complex surgical pain and will outline the various ways that it can be given. Selection criteria will be discussed along with adverse effects.

**References:**

1. Hocking G., Visser E.J., Schug S.A., Cousins M.J. (2007) Ketamine: Does Life Begin at 40? *Pain*: Clinical Updates XV (3).

2. Visser E., Schug S.A. (2006) The role of ketamine in pain management. *Biomedicine and Pharmacotherapy* 60: 341-348.

3. Petrenko A.B., Yamakura T., Baba H., Shimoji K. (2003) The role of N-methyl-D-aspartate (NMDA) receptors in pain: a review. *Anesthesia & Analgesia* 97(4):1108-1116.

4. Schug S.A. (2004) New Uses for an Old Drug: The Role of Ketamine in post-operative pain management. *ASEAN Journal of Anaesthesiology* 5(1):39-42.

5. Dickenson A.H. (1997) NMDA receptor antagonists: interactions with opioids. *Acta Anaesthesiologica Scandinavica* 41(1 Pt 2):112-115.

6. Woolf C.J., Mannion R,J. (1999) Neuropathic pain: aetiology, symptoms, mechanisms, and management. *Lancet* 353(9168):1959-1964.

7. Kehlet H., Jensen T.S., Woolf C.J. (2006) Persistent postsurgical pain: risk factors and prevention. *Lancet* 367(9522):1618-1625.

8. Crombie I.K., Davies H.T., Macrae W.A. (1998) Cut and thrust: antecedent surgery and trauma among patients attending a chronic pain clinic. *Pain* 76(1-2):167-171.

9. Macrae W.A. (2001) Chronic pain after surgery. *British Journal of Anaesthesia* 87(1):88-98.

10. McCartney C.J., Sinha A., Katz J. (2004) A qualitative systematic review of the role of N-methyl-D-aspartate receptor antagonists in preventive analgesia. *Anesthesia & Analgesia* 98(5):1385-1400.

11. Subramaniam K., Subramaniam B., Steinbrook R.A. (2004) Ketamine as adjuvant analgesic to opioids: a quantitative and qualitative systematic review. *Anesthesia & Analgesia* 99(2):482-495.

12. Bell R.F., Dahl J.B., Moore R.A., Kalso E. (2006) Perioperative ketamine for acute postoperative pain. *Cochrane Database Systematic* Review (1):CD004603

13. Laskowski M.D., Stirling A., McKay W.P., Lim H.J. (2011) A systematic review of intravenous ketamine for postoperative analgesia. *Canadian Journal of Anesthesia* 58:911-923.

**Other suggested reading:**

Chumbley G. (2010) Ketamine in uncontrolled acute and procedural pain. *The Nursing Standard* 25(15-17): 35-37.

Chumbley G. (2010). New directions in acute pain management: ketamine. In Carr ECJ, Layzell M (Eds) *Advancing Nursing Practice in Pain Management*. Wiley-Blackwell, Oxford UK.