STRATEGIES OF MANAGING REBOUND PAIN WHEN A SINGLE SHOT NERVE BLOCK WEARS OFF

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Abbreviations ; PNB - peripheral nerve block, RPS - rebound pain scores , CPNB - continuous peripheral nerve block , LA- local anaesthetic, PONV- post op nausea & vomiting

 Patients commonly describe an intense burning pain initially as the nerve block resolves, which is an undesirable clinical ramification of peripheral nerve blocks

**“Rebound pain”** or worsening pain after resolution of PNB is generally considered to be due to the mechanical­- surgical pain from unopposed nociceptive input that is uncovered after the resolution of the PNB[1,2]

**Why to treat or alleviate rebound pain?**

Rebound pain is psychologically traumatic to the patient after having developed a false sense of security that there may be no pain at all after surgery for long term future.

Mostly rebound pain occurs at night (12- 24 hrs later), disturbing the sleep & brings back the patient to the casualty if he has been discharged.

As there is increasing trend toward performing complex surgery in an ambulatory setting (driven by economic considerations), provision of appropriate pain relief & prevention of rebound pain will decrease the rate of re admission. [3]

**What happens when a single shot nerve block wears off?**

Patient starts experiencing pain & their VAS scores are more than

 ( a) patients who receive continuous nerve block or

 ( b) patients who did not get block

eg..

In patients who underwent shoulder surgery under single shot nerve block, pain relief was there for 6 to 8 hours.

Between 8 & 16 hours after surgery, patients who had the shot had almost similar pain to those who did not.

**Between 16 & 24 hours**, **those who had the shot were slightly worse off than those who did not — REBOUND PAIN** [4,5]

Age issue ;

 Rebound pain in PNB when studied for patients undergoing ankle surgery showed a tendency of occurrence in age < 60 yrs (55.5). This phenomenon was much less pronounced in patients > 60 yrs (18). [6]

**Etiology;**

Sensory nerve block causes failure of pain signal transduction. Hence memories of the signals that are not transmitted are retained. Cross - synaptic facilitation occurs finally leading to amplification of signals, when the block wears off. [2,7]

The perineural injection of neurotoxic anaesthetics on heat-­specific pain fibers may be a possible mechanism for rebound pain . Endoneural fluid pressure was significantly increased in edematous nerves.. Extrafascicular administration of clinically used concentrations of LA can alter perineural permeability, producing changes in the endoneural environment that are associated with neurotoxic injury. [8]

Bupivacaine up­regulation of cyclooxygenase 2 gene expression and resultant increased prostaglandin E2 production at the surgical site has been shown to occur and contributes to the phenomenon of rebound pain after effects of the LA have dissipated. [8]

**How long to prolong block or sustain post op analgesia?**

## In a study of ACL repair , femoral nerve block duration of 33 hours was required to reduce rebound pain scores by one unit.

Patients receiving since shot blocks experienced more pain than patients who never received block between 16-24 hrs.

Hence it is ideal to extend block or provide some form of analgesia beyond 24 hrs if possible up to 36 hours to decrease the incidence of rebound pain[1,9]

Rebound Pain Scores (RPS, defined as the pain score difference between when the block was working and when the nerve block wore off).

Anaesthesiologists may be the better personnel to determine which patients are more suitable for a continuous perineural infusion versus a single-injection nerve block, and/or which postoperative multimodal oral analgesics would be indicated to provide sustained postoperative analgesia at home after nerve block effects dissipate.

Oral analgesics that are prescribed to facilitate “transitional analgesia” after blocks resolve should ensure that patients can sustain “less-than-moderate” pain scores (4 or less on a scale of 0–10)

**How to prevent rebound pain? - Three step approach**

 (a)**Identification of high risk patients**- increased pre op pain( best predictive factor of post op pain) , anxious , young patients, females.

Type & duration of surgery- painful bony procedures, tissue trauma or lengthy procedures.

These high risk patients are to receive continuous nerve blocks or additives in single short nerve block to be pain free for at least 24-48 hrs.

(b) **Multimodal analgesic strategies**

Non opioids

Acetaminophen weak but least side effects. Combine with NSAIDs like ibuprofen (120mg/day) or celecoxib etc with due attention to side effects.

Opioids

Useful in immediate post op but due to sedation, constipation may have negative effects on early recovery & resumption of normal activity

Co analgesics

Alpha 2 delta modulators ( gabapentin 1200mg, pregabalin 150 mg)

In addition to pre-op sedation& anxiolysis ,they improve analgesia,reduce opioid requirement & hence their side effects(PONV). [10]

**Multimodal perineural analgesia**

Buprenorphine - lipophilic partial opioid agonist - has local anaesthetic like capacity to block voltage gated Na + channels. It prolongs axillary , supraclavicular blocks by 1.5 to 3 times..Nausea prophylaxis has to be addressed.

Morphine with no perineural advantage over IM/IV Fentanyl with slight prolongation by one hour are not routinely recommended.

**Vasoactive agents**

Epinephrine 5-10 mcg/ml - helps in detecting vascular injection, decreasing systemic toxicity. It is an inferior additive when compared to clonidine (extends by only 1 hr in brachial plexus block).

Clonidine alpha 2 agonist -prolongs block (120-200 min) due to direct action on peripheral nerves ( by hyperpolarisation of cyclic nucleotide gated cation channel ). Dose 0.5 mcg/kg max of 150 mcg.

Dexmedetomidine - perineural administration prolonged analgesia by 200 min (systemic administration increased duration by only 50 min).Dose 0.75 -1 mcg/kg.Hypotension & bradycardia should be treated if it occurs.

**Anti- inflammatory agents**

Dexamethasone - prolonged brachial plexus block from 730 to 1306 min.Patients had significant decreased pain on the day of surgery , less severe post op pain, better satisfaction & no increase in adverse events.In addition there was decreased rates of PONV. Effects were significant when at least 4 mg of Dexa was used perineurally than IM/ IV.Perineural **Dexamethasone prevents axon degeneration , demyelination & thereby prevents bupivacaine induced reversible neurotoxicity.** [10]

Others

Tramadol showed significant prolongation, but PONV may limit its use (similarly magnesium). Midazolam is avoided as a perineural agent.

**(c) Ready availability of rescue analgesic regimens**

 Rescue opioid injection, NSAIDS , Patient controlled analgesia..

**Continuous peripheral nerve block (CPNB)**

Continuous infusion of bupivacaine 0.25% decreased postoperative pain and the need for opioid analgesic rescue medication after orthopedic surgery involving the foot and ankle, leading to improved patient satisfaction and quality of recovery. [11,12]

CPNB is reserved for at risk patients, surgeries involving massive tissue trauma, prolonged surgeries. The benefits are evident only when the infusion is maintained for minimum of 3-4 days. The risk of catheter related infection should be borne in mind.

To conclude Single shot peripheral nerve block provides excellent analgesia in the intra op period, but the concept of rebound pain in the post op period should be well attended to by the medical team.It is at time severe enough to cause psychological trauma & affect discharge. Use of opioids will result in unpleasant side effects with little benefit.This can be best tackled by adding safe & effective perineural adjuvants in single shot blocks or by opting for continuous peripheral nerve blocks.

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