Role of Adrenaline in Spinal Analgesia

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Introduction :

Spinal analgesia is one of the popular techniques used by many anaesthesiologists, all over the world, for different types of operative procedures and sometimes for providing post-operative analgesia. The agents used by them are both long and short acting local anaesthetics as well as narcotics, the latter being used mainly for providing post-operative analgesia. In the operation theatre of Tribhuvan University Teaching Hospital also, most of the anaesthesiologists prefer using spinal analgesia, which is both economical and safer, for operative procedures where it is applicable and indicated. However, we have limited ourselves to low and mid spinal analgesia.

Agent of Choice :

The agent of choice for lower limb and perineal surgery is either 5% Heavy Xylocaine or 1% Bupivacaine, depending on the duration of surgery. For abdominal surgery, the agent of choice is mainly confined to 2% Heavy Xylocaine as 1% Heavy Bupivacaine gives very poor relaxation of the abdominal muscles. But, owing to the short duration of action of 5% Heavy Xylocaine, it becomes necessary either to give up the idea of regional analgesia or to switch over to General Anaesthesia (after the effect of regional wears off) for longer surgical procedures. This problem has been overcome to some extent by mixing Adrenaline in the 5% Heavy Xylocaine, the former extending the duration of action of the latter.

Role of Adrenaline :

Every anaesthesiologist is familiar with the role of adrenaline when mixed with the local anaesthetics used for Nerve blocks and Epidural analgesia. Adrenaline in local anaesthetic hinders the absorption of the latter by causing vasoconstriction at the site of injection and thereby prolongs the duration of action of that particular local anaesthetic.

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The effect is not marked if the local anaesthetic is one that causes vasodilatation (eg. Bupivacaine/Etidocaine), and more marked if the former is a vasoconstrictor. Xylocaine belongs to a group which is in between the above mentioned ones and therefore only a moderate increase in the duration of action results when adrenaline is mixed with it. Another effect of vasoconstriction following the use of Adrenaline is increase in concentration of local anaesthetic locally. This results into penetration, by the agent, deep down to core fibre of the nerve and thus provides profound analgesia and muscle relaxation. Besides, retardation in the absorption increases the maximum dose of the local anaesthetic that can be used safely. For example, the maximum dose of plain Xylocaine is 3 - 4 mg/kg body weight, whereas this is 7 mg/kg body weight for Xylocaine with Adrenaline.

The role of adrenaline mixed in the solution for intrathecal injection is similar to that mentioned above. Adrenaline causes spinal vasoconstriction and results into slow absorption of local anaesthetic and thus prolongs the duration of action, usually by 50 percent or more. For example, 5% Heavy Xylocaine alone lasts 30 - 90 min whereas adrenaline containing solution lasts 60 - 180 min. In our experience 5% Heavy Xylocaine without adrenaline lasts 45 minutes to 1 hours, and with adrenaline this becomes 90 min to 105 min, which is sufficient for an average major surgery (eg. Abdominal Hysterectomy, Prostatectomy etc.) However, the fixation time which is 5 - 10 minutes for Xylocaine becomes variable and unpredictably longer following adrenaline in a dose dependent way. Therefore, any request by the surgeon for head down tilt should be entertained with caution and the rise in the level of anaesthesia should be assessed carefully.

Doses and Side Effects :

The usual recommended dose of adrenaline is 50 - 75 micrograms per ml. of solution used for intrathecal injection. But in clinical practice the dose of adrenaline varies from 200 micrograms to 300 micrograms. However, the total dose should not exceed 500 micrograms. Otherwise the side effects may offset the beneficial effects. Side effects include both local and systemic. Local side effect is due to severe vasoconstriction resulting into abnormally low perfusion of the spinal cord (Ant. spinal artery syndrome). The symptom is muscular weakness of lower limbs which may last from a few hours to 7 - 10 days depending on the dose of adrenaline used.

The systemic side effect is due to absorption of adrenaline from the C. S. F. which is as rapid as from intramuscular injection. The absorbed adrenaline stimulates alpha adrenergic receptors resulting into hypertension, tachycardia, headache etc. The systemic effect is seen even in low spinal anaesthesia (eg saddle block) if higher doses of adrenaline (more than 500 micrograms) are being used. Some authors, however deny it. Because of the side effects mentioned above (and especially due to the local side effect), many anaesthesiologists are against the use of adrenaline in spinal analgesia. They, rather, prefer using other long acting local anaesthetics without adrenaline. But in a country like ours it may not be possible to use the drug of our choice everytime and in my opinion mixing of an optimum dose of adrenaline (200 - 300 micrograms) in 5% Heavy Xylocaine is an excellent alternative, and this can solve the existing problem to some extent.

References :

1. Ronald D. Miller "ANAESTHESIA" 1st edition 1982. vol: 1 pp 578, 586.
2. Lee JA, Rushman GB, Atkinson BS "A synopsis of Anaesthesia" 9th Edition, Bristol, 1982 pp 742.
3. Lebowitz PW., Newberg LA, Gillette M. T. "Clinical Anaesthesia Procedures of the Massachusetts Gen. Hospital" 2nd edition 1982 pp 94.
4. Zhuang jin et. al. "Practical Anaesthesia" (Chinese) 1st edition 1978. pp 331 332.
5. Covino BG, Vasallo HG "Local Anaesthetics Mechanism of Action and clinical use", New York 1978.
6. Blair MZ, Cardiovascular Pharmacology of local Anaesthetics Br.J Anaesthesia (suppl) 1975, 47:247.

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