**Ideal adjuvant in spinal anesthesia**

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When August Karl Gustav Bier demonstrated spinal anesthesia in the year 1898, August 16, no one would have predicted that it will last all these years to remain as one of the reliable mode of anesthesia till date with least complications.

To prolong, selectively the sensory blockade of local anesthetics in sub arachnoid block efforts were made by adding adjuvant like adrenaline or morphine.

 The word adjuvant takes itsOrigin from French/ Latin; from Latin adjuvans,

present participle of *adjuvare -* to aid or more at aid

A pharmacological agent which is added to a drug to increase or aid its efficacy or one that helps or facilitates as:

a : an ingredient (as in a prescription or a solution) that modifies the action of the principal ingredient

b : something (as a drug or method) that enhances the effectiveness of medical treatment*.*

Logically, anything which will increase efficacy and potency is an adjuvant!

There are certain characteristics/ properties which are desirable and needed in a drug, to be labelled as an

*“Ideal Adjuvant”*

Physical

Pharmacological

* + - Pharmacodynamic
		- Pharmacokinetic

Miscellaneous

**Physical characteristics:**

* + Easy solubility: preferably in water
	+ Easy miscibility: No precipitation on mixing with LA solution
	+ Non irritability: when injected
	+ Increase the pH of resulting mixture & portion of active form of LA
	+ Higher lipid solubility

**Pharmacological properties**:

Pharmacodynamics:

* + Enhance onset of action,
	+ Maintain rapid and steady peak of action
	+ Prolong the duration of action
	+ Have no inherent, any other systemic effects/ side-effects
	+ Not only enhance the efficacy of LAs, but have its own inherent LA like activity
	+ Have a higher potency, so that requirement of dose is minimal
	+ Should be completely devoid of any systemic toxicity
	+ **Pharmacological properties**:
	+ Pharmacokinetics:
	+ Minimal systemic absorption
	+ High protein binding
	+ Rapid redistribution
	+ Rapid plasma clearance Rapid metabolism
	+ Non active Metabolites
	+ Simple non hepatic/ non renal dependent excretion

**Miscellaneous properties:**

* + Should be economical
	+ Should be freely available/ non-scheduled drug
	+ Should not require any specific conditions for the storage

**Mechanisms of Action:**

* To decrease the uptake at the site of injection:
* Change of pH/ pKa:
* To Increase baricity:
* To increase shelf life and sterility:
* To form the water soluble complexes at the site:
* To increase the penetrability across the tissue planes:
* To prolong the duration of analgesia, both intra/ post-operative

 **Vasoconstrictors**

* + Braun - Cocaine(1903)
	+ Adrenaline is pre-added to the marketed preparations, as 1: 100,000 to 200,000 concentrations.
	+ **Adrenaline** - Inherent analgesic action
	+ Direct stimulation of alpha-2 adrenoreceptors
	+ Decreasing presynaptic release of neuro-transmitter from C- and A δ- fibres in the substantia gelatinosa of the dorsal horn – Rexead column I and II
1. Opioids

 Hydrophilic opioids - Morphine, Diamorphine

 Lipophilic opioids - Fentanyl, Alfentanil, Sufentanil

1. Alpha2 (α2) agonists: Clonidine, Dexmedetomidine
2. GABA receptor agonists:

 GABA A receptor agonist - Midazolam

 GABA B receptor agonist – Baclofen

1. NMDA receptor antagonist: Ketamine
2. Neostigmine: Cholinesterase inhibitor (CHEI)
3. Tramadol
4. Glucocorticoids: Dexamethasone
5. NSAIDs
6. Magnesium
7. Neuro-Muscular Blocking Drugs
8. Dextrans
9. Adenosine

Among the above mentioned adjuvants except adrenaline and Clonidine others are not suitable to add as additives as they will cause some unwanted side effects.