



**A COMPARATIVE STUDY OF EFFICACY OF ONLY GA VIS A VIS COMBINATION OF INTERSCALENE BRACHIAL PLEXUS BLOCK AND GA FOR ACHIEVING HYPOTENSIVE ANAESTHESIA ALONGWITH POSTOPERATIVE PAIN RELIEF IN SHOULDER ARTHROSCOPY.**

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**ABSTRACT**

**Background:** Shoulder arthroscopies require bloodless field for visualization hence the need for hypotensive anaesthesia. **Aim:** In this study we have administrated Interscalene Brachial Plexus block prior to GA to achieve hypotension with added advantage of satisfactory postop pain relief and did a comparative study. **Methods:** A prospective comparative study was done between the two groups (Gp G consisted only GA and Gp GIS consisted Interscalene Brachial Plexus Nerve block followed by GA), in a zonal government hospital. 45 pts were studied in Gp G and 46 in Gp GIS. In the ISBN a fixed solution and constituents were injected (20 ml of 0.5% Bupivacaine and 10 ml 2% lignocaine). Pharmacological agents used were Metoprolol, NTG or both. SPSS ver 16 was used for statistical analysis. **Results:** In GIS Group 12 out of 46 needed pharmacological intervention in contrast to G group where 37 out of 45 patients needed pharmacological intervention to achieve hemodynamic goal. *Second objective* was post op pain relief. In Group G 26 patients out of 45 needed both NSAID and opiates & 19 needed only NSAIDS in first 12 hours post op. In Group GIS only 05 patients out of 46 needed NSAIDS and 2 also needed opiates in first 12 hours. Applying unpaired t test the value of t test was found to be 46.35 and it was highly significant with P value <0.05 (p: 0.000). SPSS ver 16 was used. **Conclusion:** Our results clearly indicate that goals like hemodynamic stability and adequate pain relief in post-operative period can be achieved with ISB prior to GA marginalizing the use of hypotensive pharmacological drugs.

**KEYWORDS:** *General anesthesia (GA), Interscalene Brachial Plexus Nerve Block (ISBN), Shoulder Arthroscopy, hypotensive hemodynamics, postop pain relief, hypotensive pharmacological agents, opioids and Non-Steroidal Anti-inflammatory Drugs (NSAID).*

**INTRODUCTION**

Shoulder arthroscopies have replaced almost all open surgeries of shoulder since the advances in arthroscopic equipment and techniques. This less invasive technique has reduced the traumatic procedure at the shoulder and at the same time hospital stay of patients has been significantly truncated. In some institutes shoulder arthroscopy is becoming a day care procedure.

Shoulder surgeries with arthroscope have limited maneuverability due to limited space of joint, so muscle relaxation is very important for these surgeries. At the same time any bleed during the procedure can obscure the visibility of the surgeon where no tourniquet can be applied unlike knee arthroscopy. To deliver a blood less field anaesthesiologist has to rely on hypotensive anaesthesia techniques.

Conventionally shoulder surgeries were done under General Anaesthesia only (GA). GA per se has inherent disadvantages like, mostly relying on pharmacological hypotensive agents and also post-operative pain relief is not as good as provided by regional anesthesia.<sup>[1,2]</sup> This leads to increased opiate usage, aggravating post operative nausea and vomiting (PONV) like issues which also trouble the patient in post-operative period.

With advances in regional block techniques, several advantages associated with the peripheral nerve blocks, supplement general anaesthesia. Interscalene brachial plexus block (ISB) anaesthesia has been widely used, with or without GA, in patients undergoing shoulder surgery.<sup>[3,4,5]</sup> In our study we have advocated interscalene brachial plexus block (ISB) prior to general anaesthesia. After ascertaining the onset of desired sensory and motor effects of ISB, GA is administered.

Few studies regarding Haemodynamic parameters for individual techniques have been done<sup>[6,7,8,9]</sup>, but there is no systematic investigation comparing achieving hypotensive anesthesia under general anaesthesia alone and general anaesthesia plus interscalene block.<sup>[10]</sup> At the same time we studied quality of pain relief in the two group's post-operative period, affecting opiate and Non Steroid Anti Inflammatory Drug (NSAID) requirement.

### AIMS AND OBJECTIVES

Aim is to effect hypotensive field for arthroscopic shoulder surgeries by administration of Interscalene block and follow it by GA. This technique is compared with GA only. At the same time quality of postop pain relief is also compared in both techniques.

### MATERIALS AND METHODS

The present prospective randomized study was carried out in Department of Anaesthesiology and Critical Care of a tertiary care orthopedic hospital, in Pune (India) from Jul 2015 to Aug 2016. Patients included were all undergoing shoulder arthroscopy. The following inclusion criteria were taken into consideration for subjects included in study.

#### Inclusion Criteria

1. Adult patients aged between 18-55 y
2. ASA grade 1 and 2 physical status
3. Scheduled for elective surgery
4. No history of allergy or sensitivity to any of the studied local anaesthetics.

#### Exclusion criteria

1. Patients with significant cardiovascular disease, Hypertension, renal failure, hepatic dysfunction, Diabetes and chronic pulmonary disease.
2. Neuromuscular disorder,
3. Morbid obesity,
4. Bleeding disorders,
5. Infection at the local site,
6. Uncooperative patients.

The patients were randomly divided into two groups using computerized randomization table.

**a) Group G (n=45):** Patients proposed to undergo shoulder arthroscopic surgery under General anesthesia with standard drugs and procedure.

**b) Group GIS (n=46):** Patients proposed to undergo shoulder arthroscopic surgery under GA and ISB with Nerve stimulator using standard drugs and procedure.

Informed consent was obtained from all the patients enrolled in the study. Ethical clearance was taken from institute's ethical committee. All the patients were asked to remain nil orally after 2200hrs as per standard protocol / 8-10 hrs prior to surgery. Patients were allocated to the respective groups by computer generated randomization tables. Those allocated to GIS group received 50 µg injection fentanyl intravenously prior to interscalene block. Interscalene block was given with

nerve stimulation technique by the anaesthesiologist. Drug was given when muscle twitching was still present at 0.3-0.4mA current. Drug used was combination of Inj Bupivacaine (0.5% 20ml) and lignocaine with adrenaline (2% 10 ml). No other additive was used.<sup>[11]</sup> The total volume of local anaesthetic drug given for block varied between 30-35 ml. Sensory and motor block were evaluated preoperatively to determine a baseline and every 5 min for 30 min or until onset of blockade was noted and thereafter every 60 min (post-op).

Sensory block was assessed by the pinprick method (26G hypodermic needle) as well as ether swab. Assessment of sensory block was done in the dermatomal areas corresponding to suprascapular nerve, median nerve, radial nerve and musculocutaneous nerve till complete sensory blockade was achieved. Sensory onset was considered when there was a dull sensation to pinprick and loss of cold sensation with ether swab, along the distribution of any of the above-mentioned nerves. Complete sensory block was considered when there was complete loss of sensation to pinprick.

Sensory block was graded as-

Grade 0: Sharp pin felt

Grade 1: Analgesia, dull sensation felt

Grade 2: Anaesthesia, no sensation felt.

A modified Bromage Scale<sup>[12]</sup> for the upper extremity was used to assess motor function. This scale consists of the following four scores:

0 - able to raise the extended arm to 90° for a full 2 sec

1 - Able to flex the elbow and move the fingers but unable to raise the extended arm.

2 - Unable to flex the elbow but able to move the fingers

3 - Unable to move the arm, elbow or fingers

Onset of motor blockade was considered when there was Grade 1 motor blockade. Peak motor block was considered when there was Grade 3 motor blockade. Block was considered to have failed when sensory anaesthesia was not achieved within 30 min. These patients were then excluded from the study.

Haemodynamic parameters and vitals (Blood pressure, Heart rate, Respiratory rate and Oxygen saturation) were also monitored during the procedure continuously.

Duration of analgesia was assessed by using a 10 point Visual Analogue Scale (VAS)<sup>[13]</sup> in which a score of "0" indicates "no pain" and a score of "10" "worst pain imaginable". The VAS measurements were obtained every 60 mins till 12 hours post-operative period. The rescue analgesia in the form of inj. Diclofenac sodium (75 mg) intramuscularly was administered at the Visual Analogue Scale score of 6, if pain relief was still inadequate after 30 min IV Morphine 4.5mg was given and repeated after 2 hrs if pain relief was still inadequate.

Duration of sensory block was determined by noting the time when there was return of dull sensation to pin prick and duration of motor blockade was determined by noting the time the patients could first move their elbow.

Side effects such as bradycardia, hypotension, headache and convulsions were looked for. GA was given in both the groups with Premedication: IV Fentanyl 1 mcg/kg and IV Glycopyrrolate 0.2 mg. Induction was by sleep dose of IV Propofol, intubation carried out with oral ETT of appropriate size after IV Vecuronium 0.1 mg/Kg and maintenance by O<sub>2</sub>+N<sub>2</sub>O+Sevoflurane 1-2%. Muscle relaxation was reversed at the end of the surgery with IV Neostigmine 50mcg/Kg and Glycopyrrolate 20 mcg/Kg. HR was kept between 70-80/min, systolic BP between 85 to 90 mmHg, with IV Metoprolol in boluses of 1mg and with infusion Nitroglycerine(NTG) if required. A note was made of those who needed these.

## RESULTS

Both groups demographically were comparable for age weight and gender. No significant difference was seen in both the groups under investigation.

Blood pressure In group G (n=45) patients needing NTG alone were 18, NTG & metoprolol (both) were given to 11 patients, and 8 needed only metoprolol to achieve SBP between 85-90 mmHg and HR of 70-80 per minute i.e. 37 out of 45 needed additional drug for hemodynamic control. In remaining eight patients

hemodynamic control was through GA only, i.e. no additional drug was needed.

Group GIS (n=46): 10 patients needed metoprolol, 02 needed NTG & none of the patients needed NTG & metoprolol combination. i.e. 12 out of 46 needed pharmacological intervention.

## Pain

Second objective we observed for post op pain relief. In Group G 26 patients out of 45 needed NSAID and opiates in first 12 hours of post op period, 19 needed only NSAIDS in first 12 hours of post op. In this group mean pain relief duration was 42.32 minutes in post-operative period when analgesics were needed.

In Group GIS only 05 patients out of 46 needed NSAIDS and 2 needed opiates & NSAIDS in first 12 hours. Rest of patients did not ask pain relief for initial 12 hours of post-operative period. Mean duration of pain relief in this group was 473.93 minutes (Table – 1).

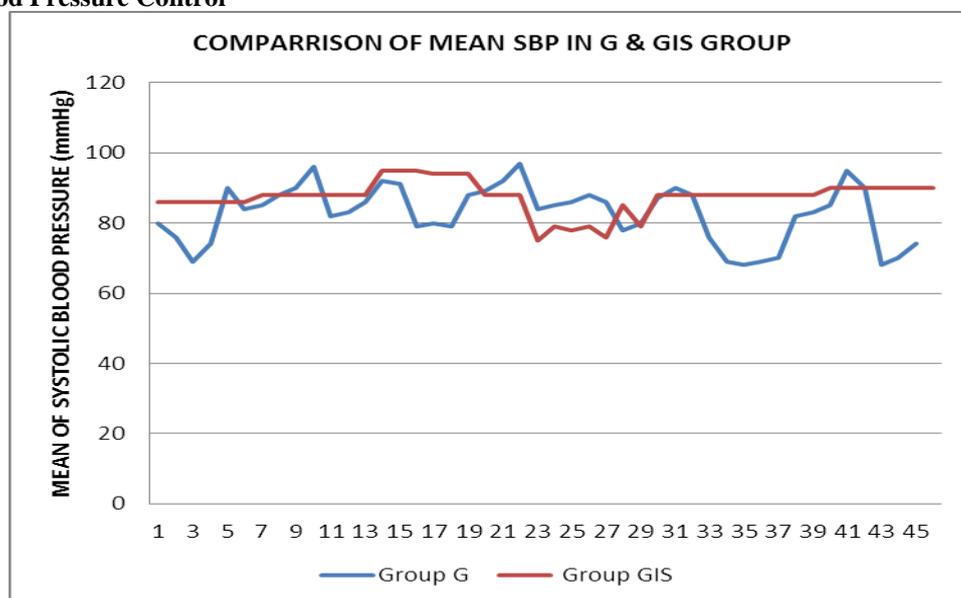
Applying unpaired t test to group which were given GA and group which were given GA with ISB, the value of t test was found to be 46.35 and it was highly significant with P value <0.05 (p:0.000). SPSS ver 16 was used.

BP in all cases recovered after stopping NTG and recovery of GA. No patient required ionotropic support to bring the BP up. There were no episodes of acute or chronic local anaesthetic toxicity.

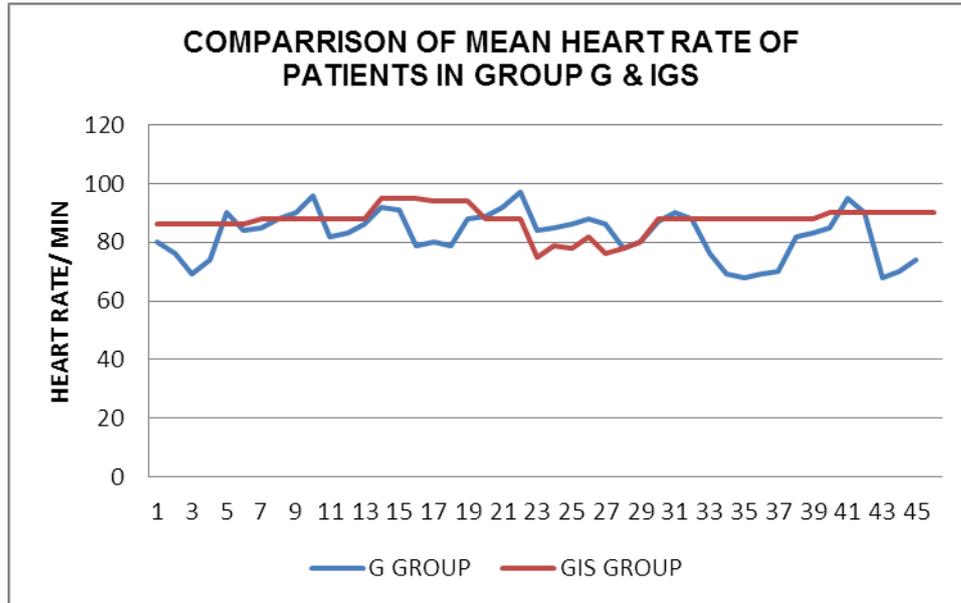
**Table 1: Statistical analysis of two group hemodynamic variables during the surgical procedure.**

	SBP G group	SBP GIS group	Pulse G group	Pulse GIS group	Pain relief G group needed (min)	Pain relief GIS group (min)
Mean	88.86	87.93	88.19	70.54	42.32	473.93
Std. Deviation	2.90	1.70	8.00	3.82	19.36	59.39

## Diagram Blood Pressure Control



## Diagram Heart Rate

**DISCUSSION**

The field of Anaesthesia is forever dynamic with newer theories and innovative interventions to maximize benefit to the patient and improving patient safety. Regarding the present study, the improvisation done here is that the aim of administering ISB prior to GA was to achieve hypotensive anaesthesia. This reduced the requirement of pharmacological hypotensive agents (NTG and Metoprolol), and obtained a non-labile hemodynamic goal, increasing standards of patient safety. At the same time additional benefit of profound pain control was achieved in postop period with continuation of stable hemodynamics.

Shoulder surgery is frequently associated with severe post-operative pain; especially within the first 12 h. Pain control is important in this setting, not only to improve the patient's wellbeing, but also to facilitate rehabilitation.<sup>[14]</sup> D'Alessio J *et al.*<sup>[15]</sup> suggested that supplementing GA with ISB avoids the stress experienced by the patient on coming out of GA and immediate postop period. This also facilitates shortening of the hospital stay. In the present study, arterial blood pressure and heart rate in patients receiving GA alone varied significantly (Table 1). The surgeon preferred supine lateral position for better visualization and manipulation around structures. To achieve a hemodynamic target in this setup where patients are in supine lateral, hypotensive target was achieved mostly with pharmacological intervention.<sup>[16]</sup> These patients needed NTG and metoprolol administration during the procedure, frequently vis a vis the sitting position. *Sitting position causes pooling of blood in the lower extremities, thus decreasing ventricular volume and cardiac output.*<sup>[17,18]</sup> In our study the surgeon preferred the supine lateral position for surgery; therefore hypotensive contribution of sitting position was eliminated.

In GIS Group 10 patients needed metoprolol, only 02 needed NTG & none of the patients needed NTG & metoprolol combination. i.e. 12 out of 46 needed pharmacological intervention in contrast of G group where 37 out of 45 patients needed pharmacological intervention to optimize the hemodynamic control. During use of pharmacological hypotensive agents, balance of hemodynamics achieved in GIS group was easy to achieve compared to patients of G group. On most of the occasions in GIS Gp, adjusting the inhalational Mean Alveolar Concentration (MAC) minimally was adequate to achieve mild hemodynamic alterations.

The volume of drugs used was fixed (20ml bupivacaine plus 10 ml 2% lignocaine with adrenaline = 30ml), to standardize the technique. Lignocaine was added for faster onset of block and additional benefit of vasoconstrictive contribution of adrenaline in reducing absorption of the Local Anaesthetic.<sup>[19,20]</sup>

*Addition of ISB prior to surgery produces a sympathetic blockade, cutting off the autonomic response to surgical stimuli. Infiltration of local anaesthetics blocks the sodium channels. This results in blockade of the peripheral pain pathway via ISB, cuts off the CNS response to painful stimuli, indicated by the heart rate remaining steady<sup>[21]</sup> on incision and further manipulation thereafter.* Blood pressure as a consequence of above remained steady. At this point, addition of GA blocked the remaining awareness stimuli and the hypotensive nature of the GA produced the required hypotensive target.

The limitations in our study were that the patient populations were all healthy, mostly young individuals of ASA physical status I & II. We also did not include patients with antiplatelet treatment as interscalene block

might result into increased incidence of bleeding due to needle trauma.

## CONCLUSION

Our results clearly indicate that goals like hemodynamic stability and adequate pain relief in post-operative period can be achieved with ISB prior to General anaesthesia. The combination of this anaesthesia technique has resulted in a very satisfactory hypotensive parameters as desired by surgeons, marginalizing the use of hypotensive pharmacological agents which have their own moderate to serious side effects.

Hypothetically this study can be extrapolated on patients with co- morbidities like bronchial asthma, in whom beta-blockers are better avoided, patients with compromised cardiac states like CAD, LVH etc, who cannot be exposed to high variations in hemodynamics during surgical intervention resulting into life threatening situations. In such patients this hypotensive technique will be especially beneficial, enhancing patient safety. For this study to get extrapolated in above target population, larger population needs to be studied with wider inclusion criteria.

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