

Intravenous Regional Anesthesia Bier's Block: An Experience in Upper Limb Surgeries

Badaruddin Sahito,^{*} Rafia Tabassum,^{**} Muhammad Tahir,^{***} Ghulam Mahboob^{****}

ABSTRACT

Objective: To assess the effectiveness, safety and complications of Intravenous Regional Anesthesia (IVRA) or Bier's block in the upper limb surgeries.

Study Design: Observational

Place & Duration: Department of Orthopedics, Jinnah Postgraduate Medical Centre, Karachi-Pakistan.

Material & Methods: A total of one hundred patients were randomly selected from the Accident & Emergency department and Out Patient Department (O.P.D) from 18 to 45 years of age. They were operated with Bier's block for emergency and elective procedures of the upper limb in the Department of Orthopedics at Jinnah Postgraduate Medical Centre, Karachi-Pakistan.

Results: The effectiveness of Bier's block ranged from 30 to 70 minutes with an average of 50 minutes. Complications were transient tourniquet palsy and discomfort to patient.

Conclusion: Bier's block is an effective form of IVRA; preferred for short surgical procedures lasting for less than fifty minutes having limitations to tourniquets. Therefore; Bier's block is not preferred in surgical procedures of longer duration.

Key Words: Bier's block, Upper limb surgeries, Emergencies.

INTRODUCTION

Biers block or regional anesthesia was first performed by AUGUST KARL GUSTAV Bier in 1908. University of Edinburgh in 1910 published work on intravenous anesthesia followed by CM Holmes in 1963 and Wallace and Milane in 1970s.¹ Initially IVRA was popular, but remained

controversial because of toxicity of xylocaine and bupivacaine.

IVRA is a safer alternative to general anesthesia and most commonly used for procedures involving upper limb, such as Colle's fracture and other distal radius fracture in emergency, facilitate surgery around elbow, hand fractures and tendon repair²⁻⁶. IVRA is also used to manipulate stiff joint associated with reflex sympathetic osteodystrophy.⁷ As botulinum toxin injection is used under IVRA to treat palmar hyperhidrosis.⁸ IVRA is easy to administer, low cost and well tolerated. It is rapid in onset.^{9,10} The philosophy of Bier's block is to stop the blood supply towards the extremity via an arterial tourniquet, there by isolating it from the circulation and then injecting local anesthesia into venous system of the extremity.

Prilocaine is safe, cheap and well tolerated and high patient satisfaction.¹¹ It is a drug of choice with only side effect of methemoglobinemia. Xylocaine and bupivacaine are other local

- * Assistant Professor, Department of Orthopedics Surgery, DOW University Hospital, Karachi.
- ** Assistant Professor, Department of Anaesthesiology, SICU & Pain management center, PUMHS, Nawabshah.
- *** House officer, Jinnah Postgraduate Medical Centre, Karachi, Sindh, Pakistan
- **** Professor & Head, Department of Orthopedics Surgery, Jinnah Postgraduate Medical Centre, Karachi.

Correspondence to:

Dr. Badaruddin Sahito

Assistant Professor,
Department of Orthopedics Surgery,
DOW University Hospital, Karachi.

anesthetic drugs used but have more side effects like seizures and arrhythmias.¹² Ropivacaine provides longer anesthesia after deflation.¹³ Alfentanil and atracurium and clonidine are used as adjuvants with local anesthetic agent (xylocaine) to improve muscle relaxation and analgesia but benefits are limited and not clear.¹⁴ Dexmedetomidine or lornoxicam with prilocaine decreases pain, improved anesthesia quality and decreases analgesic requirements.¹⁵ IVRA is associated with problems like pain at tourniquet site, accidental cuff deflation, failure to inflate cuff, compartmental syndrome.¹⁶ IVRA is contraindicated in patient with sickle cell disease, crush injuries, Raynaud's disease, cellulitis and young children.¹⁷ Before IVRA fasting is required for 2 to 4 hours. Bier's block is now commonly used in day care surgery with no deaths, minimal morbidity and success rate in 98%.¹⁶ Based the existing literature, this study was conducted to assess the effectiveness, safety and complications of Intravenous Regional Anesthesia (IVRA) or Bier's block in the upper limb surgeries.

MATERIAL & METHODS:

All patient included in this study were selected according to the inclusion criteria at A&E Department and OPD. The inclusion criteria were patients aged between 18 to 45 years of either sex who underwent surgery in emergency or elective distal to elbow. Patients excluded from the study were those having open fractures, infective focus on ipsilateral arm, patients with ischemic heart disease, Raynaud's phenomenon, systemic sclerosis, sickle cell anemia, diabetes mellitus, renal failure, hepatic dysfunction, pregnancy and history of convulsions.

All patients were assessed clinically and on routine investigations i.e. Full Blood Count, Serum Urea, Creatinine, Electrolytes and random Blood Sugar were carried out. ECG was done in patients above 40 years of age. All patients were fasted for four hours. After preparation, ECG electrodes were placed and rhythm was monitored and blood pressure measured. A cannula was inserted as distal as possible in the limb to be operated upon. Second cannula was inserted into the opposite arm for

intravenous access.

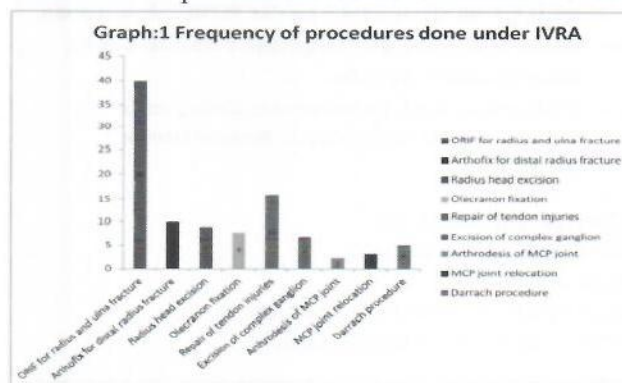
The limb was exsanguinating either with an Esmarch rubber bandage or by simply elevating the limb for 2 to 3 minutes. Proximal tourniquet applied and inflated to the appropriate pressure. Xylocaine 2% prepared in 30 ml distilled water and injected over 1 to 2 minutes. Dose of xylocaine was 3 mg/kg. After five minutes second tourniquet was applied distal to the first one and the proximal one was released. The first tourniquet was applied as high as possible.

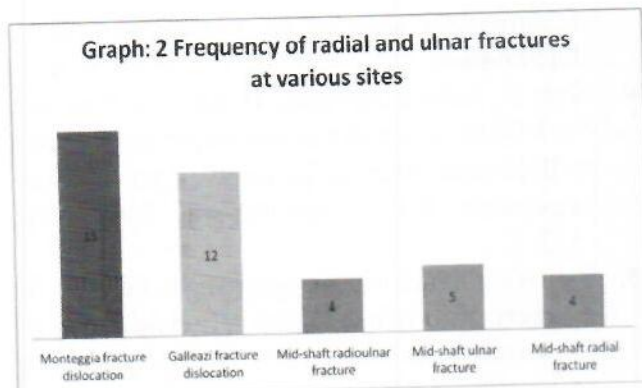
RESULTS:

A total of 100 patients were operated with Bier's block for emergency and elective procedures at the department of Orthopedics Surgery at Jinnah Postgraduate Medical Center, Karachi in one year. i.e. April 2012 to March 2013.

Age ranged from 18 to 45 years, average age being 30 years. Out of these 78 were males and 22 females. The duration of Biers block ranged between 30 to 70 minutes with average 50 minutes. Out of 100 patients Open Reduction and Internal Fixation (ORIF) for radius and ulna fractures were done in 40 patients (Graph1), remaining patient underwent various procedures mentioned in Graph 2.

Peroperatively a few problems were noted, that includes pain due to tourniquet observed in 20 patient in initial few minutes especially in those patients in which first tourniquet is applied in mid arm, tachycardia noted in 20 patients, and difficulty was noted during reducing the fracture around the elbow, lateral condyle, olecranon fracture because of tourniquet did not allow stretching of triceps muscle. Postoperatively Tourniquet palsy observed in 4 patients that resolves within 6 weeks.





DISCUSSION:

In trauma and emergency department a large number of cases are those of fracture and limb injuries resulting from road traffic accidents that need rapid induction, shortened recovery time, and minimal hospital stay. Intravenous regional anaesthesia (IVRA) is a relatively safe, simple, cheap, easily applicable, time saving and effective way to provide adequate relaxation and analgesia for upper extremity surgeries.¹⁸ The advantages of IVRA are high indices of reliability, rapid onset of analgesia within 5-10 minutes and good muscular relaxation. The disadvantage of IVRA is the application of a tourniquet, which must remain inflated continuously throughout the procedure. The duration of surgery is limited by the time during which the arterial tourniquet could be kept safely inflated. Tourniquet pain, which is described as a dull and aching pain sensation, is a well-known limitation of IVRA. Another drawback with this technique is the absence of postoperative analgesia.¹⁹

In our study 100 patients operated with Bier's block for emergency and elective surgeries and we found that the Bier's block is rapid in onset, and provides excellent analgesia for short orthopaedic procedures. We found that little or no supplemental medication is necessary when using IVRA is a distinct advantage for ambulatory surgical procedures. Since the anaesthetic effect recedes within 15-20 minutes, patients can be safely discharged from the post-anaesthetic care unit more promptly than other anaesthetic techniques are used. For patients who require emergency surgery on an extremity, the danger of aspiration of gastric contents is decreased when depressant drugs are avoided.²⁰ We observed disadvantages

like tourniquet pain and intraoperative discomfort in few patients.

Study conducted at Edinburgh included 1200 patient with fracture of distal radius, they concluded that intravenous regional anesthesia provides better analgesia during fracture manipulation, and enables better and easier reduction.² Multicenter study was conducted at England and Wales where authors mention that 17% of Bier's block is used in A&E to treat distal radius fracture, but still guidelines are required to improve care.³ At Singapore, forearm based Bier's block was used for manipulation and reduction of closed distal radius fracture in emergencies that shows it is an effective alternative to conventional block with no major complication.⁶ Balheta, mention that IVRA is safe, effectively alleviates pain associated with botulinum toxin.⁸

In a retrospective review of 15 years in which patient underwent Colles fracture manipulation and found that all patients were satisfied with method of anesthesia. There were no complications except the pressure cuff inflation was worst part of procedure.¹¹ Studies at Canada, reported seizures being associated with xylocaine and development of compartment syndrome in six patients.¹⁵ At Birmingham, 732 patients underwent day care hand surgery by IVRA they mention Bier's block as ideal form of anesthesia in day case surgery with no deaths, minimal morbidity with success rate of 98%.¹⁸

CONCLUSION:

Intravenous regional anesthesia is safe and effective method of anesthesia for elbow, forearm and hand surgeries. It is one of the best methods of anesthesia for day care orthopaedic surgery. But selection of patients and continues monitoring during the procedure is key to success for this procedure. Standardization of Bier's block is required in emergency department.

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