Original Research Paper

Volume-10 | Issue-2 | February - 2020 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Anaesthesiology

A RANDOMIZED CONTROLLED TRIAL OF PRE ADMINISTRATION OF LOW DOSE KETAMINE IN REDUCING TOURNIQUET INDUCED PAIN IN UPPER LIMB BLOCKS

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ABSTRACT This Study Investigated The Effect Of Pre-operative Low Dose Of I.v Ketamine On Tourniquet Induced Pain And Heamodynamic Changes After Brachial Plexus Block. Just Before Application Of Tourniquet 0.25mg/kg I.v Ketamine (Ketamine Group N=40) Diluted To 5ml And Control Group N=38 5ml Were Administered. Systolic, Diastolic Blood Pressure And Heart Rate Relative To Tourniquet Inflation And Deflation Were Recorded And Compared Between The Two Groups. Systolic, Diastolic And Mean Blood Pressure Increases Significantly After 30 Minutes Of Tourniquet Inflation In Control Group As Compared To Ketamine Group.so, We Conclude That Pre Operative Low Dose 0.25mg/kg Of I.v Ketamine Can Prevent A Systemic Arterial Pressure Increase After Tourniquet Inflation Under Supraclavicular Brachial Plexus Block.

KEYWORDS : Pain, Tourniquet Pain, Low Dose Ketamine , Supraclavicular Brachial Plexus Block

INTRODUCTION

- THE INTERNATIONAL ASSOCIATION FOR THE STUDY OF PAIN(IASP) HAS DESCRIBED PAIN AS "AN UNPLEASANT SENSORY AND EMOTIONAL EXPERIENCE ASSOCIATED WITH ACTUAL OR POTENTIAL TISSUE DAMAGE, OR DESCRIBED IN TERMS OF SUCH DAMAGE".[1]
- TOURNIQUET PAIN IS DESCRIBED AS A POORLY LOCALIZED, DULL, TIGHT, ACHING SENSATION AT THE SITE OF TOURNIQUET APPLICATION. THE EXACT ETIOLOGY IS UNCLEAR, BUT IT IS THOUGHT TO BE DUE TO A CUTANEOUS NEURAL MECHANISM[2]
- THIS "SLOW" PAIN VIA UNMYLELINATED C FIBER IS NORMALLY INHIBITED BY EARLIER ARRIVING "FAST" PAIN IMPULSES FROM MYELINATED A-DELTA FIBERS.
- AFTER ABOUT 30 MIN OF TOURNIQUET COMPRESSION THE A-DELTA FIBERS ARE BLOCKED, THUS REMOVING INHIBITION FROM THE STILL FUNCTIONING SMALL C-FIBERS[3]
- VARIOUS APPROACHES HAS BEEN TRIED BUT THE ONLY THING THAT WORKS RELIABLY IN DECREASING TOURNIQUET PAIN IS TOURNIQUET DEFLATION.
- KETAMINE IS A CYCLOHEXANONE DERIVATIVE WITH ANALGESIC AND ANAESTHETIC PROPERTIES. KETAMINE IS AN IV ANESTHETIC WITH ANALGESIC PROPERTIES IN SUBANESTHETIC DOSES[4][5][6][7][8]
- STRONG PAIN STIMULI ACTIVATE NMDA RECEPTORS AND PRODUCE HYPEREXCITABILITY OF DORSAL ROOT NEURONS. THIS INDUCES CENTRAL SENSITIZATION, WIND-UP PHENOMENON, AND PAIN MEMORY. KETAMINE, A NONCOMPETITIVE ANTAGONIST OF NMDA RECEPTORS, CAN PREVENT THE INDUCTION OF CENTRAL SENSITIZATION CAUSED BY STIMULATION OF PERIPHERAL NOCICEPTION AS WELL AS BLOCKING THE WIND-UP PHENOMENON[9].

AIMS AND OBJECTIVE

- PRIMARILY, TO STUDY THE EFFECT OF I.V KETAMINE ON PAIN REDUCTION AND HAEMODYNAMIC PARAMETERS ON TOURNIQUET APPLICATION ON UPPER LIMB BLOCKS.
- TO COMPARE THE INCIDENCE OF HYPERTENSION DUE TO TOURNIQUET INDUCED PAIN IN PATIENTS RECEIVING LOW DOSE KETAMINE VS PLACEBO.
- SECONDARY, TO EVALUATE THE ADVERSE EFFECTS OF I.V KETAMINE AND ANY OTHER OBSERVATIONS.

MATERIALS AND METHODS

- ETHICAL CLEARANCE- INSTITUTIONAL ETHICAL COMMITTEE, GMCH, ASSAM (NO.MC/190/2007/PT-1/1EC/101).
- DURATION OF STUDY -JULY 2018 TO JUNE 2019.
- PLACE OF STUDY- DEPT OF ORTHOPAEDIC SURGERY, GMCH
- TAKING INTO ACCOUNT THE DATA REPORTED BY SATSUMAE T ET AL AND PARK J W ET AL-
- A SAMPLE OF 38 PATIENTS IN EACH GROUP WAS NECESSARY TO DETECT A 30% DIFFERENCE IN TOURNIQUET INDUCED HYPERTENSION WITH AN ALPHA VALUE OF 0.5 AND BETA VALUE OF 0.1 CONSIDERING A DROPOUT OF 20% 46 PATIENTS IN EACH GROUP WERE INCLUDED.
- RANDOMIZATION – RANDOM NUMBER TABLE WAS GENERATED FROM WWW.RANDOM.ORG

INCLUSION CRITERIA:

1. PATIENTS BELONGING TO ASA- I AND II
2. BOTH SEXES
3. AGE-18 -60 YRS.
4. PATIENTS UNDERGOING UPPER LIMB SURGERY UNDER SUPRA CLAVICULAR BLOCK WHERE TOURNIQUET IS USED

EXCLUSION CRITERIA:

- PATIENT REFUSAL.
- MORBIDLY OBESE.
- HYPERTENSIVE.
- DIABETES MELLITUS.
- PREGNANT AND LACTATING WOMEN
- HYPERTHYROID.
- PATIENTS ON ALPHA AND BETA ADRENERGIC BLOCKERS.
- PATIENTS ON HEART BLOCK, BRADYCARDIA, HYPOTENSION OR CARDIOVASCULAR DISEASE.
- SIGNIFICANT RESPIRATORY, HEPATIC OR RENAL DISEASE.
- KNOWN ALLERGY TO STUDY DRUGS.
- SIGNIFICANT INTRA-OPERATIVE HAEMORRHAGE.
- PATIENTS WITH HISTORY OF DRUG ABUSE.
- PATIENTS MEETING INCLUSION AND EXCLUSION CRITERIA DIVIDED INTO TWO GROUPS RANDOMLY ACCORDING TO RANDOM TABLE.
- A WRITTEN INFORMED CONSENT WAS OBTAINED FROM ALL THE PATIENTS PRIOR TO START OF THE STUDY AFTER EXPLAINING THE TYPE OF ANESTHETIC PROCEDURE TO BE PERFORMED AND THE COMPLICATIONS ASSOCIATED WITH THE PROCEDURE.
- ACCORDING TO RANDOMIZATION PATIENT WERE ALLOTTED IN TWO GROUPS AND ONE RECEIVED LOW DOSE 0.25MG/KG BODY WEIGHT KETAMINE DILUTED TO 5ML (GROUP A) AND OTHER RECEIVED 5ML OF NORMAL SALINE (GROUP B).
- ALL THE PATIENTS RECEIVED SUPRACLAVICULAR

BLOCK USING 0.5% ROPIVACAINE ACCORDING TO STANDARD INSTITUTIONAL PROTOCOL.
- DRUGS WERE DELIVERED JUST BEFORE APPLICATION OF TOURNIQUET AFTER CONFIRMING THE SUCCESS OF THE BLOCK.
- ANY CASE WITH BLOCK FAILURE OR NOT ADEQUATE FOR THE SURGERY WAS EXCLUDED FROM THE STUDY.
- VITALS WERE MONITORED BY A JUNIOR TRAINED RESIDENT AT AFOREMENTIONED TIME PERIOD.

RESULTS
- DATA COLLECTED AND ANALYZED.
- STATISTICAL TESTS EMPLOYED WERE (AS APPLICABLE) WERE
- PAIRED AND UNPAIRED T-TEST
- FISHERS EXACT TEST
- CHI-SQUARE TEST.
- SOFTWARE USED- GRAPHPAD INSTAT VERSION 3.0
- MICROSOFT WORD AND MICROSOFT EXEL WERE USED TO GENERATE GRAPHS AND TABLES.
- P VALUE – P < 0.05 WAS CONSIDERED SIGNIFICANT.

AGE

GROUP A		GROUP B		MEAN DIFFERENCE	P VALUE	SIGNIFICANCE
MEAN	SD	MEAN	SD			
31.525	6.583	31.632	8.162	0.1066	0.9491(T)	NS

SEX

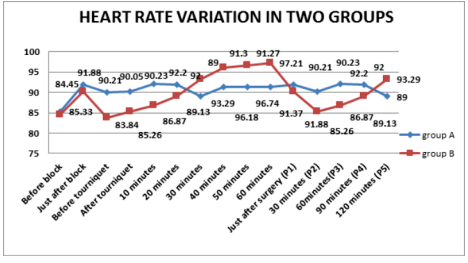
GROUP A		GROUP B		P VALUE	SIGNIFICANCE
MALE	FEMALE	MALE	FEMALE	1.0000(C)	NS
27	13	26	12		

ASA

GROUP A		GROUP B		P VALUE	SIGNIFICANCE
ASA I	ASAII	ASA I	ASA II	0.6578(C)	NS
20	20	17	21		

HEART RATE

TIME(MINS)	GROUP A		GROUP B		MEAN DIFFERENCE	P VALUE	SIGNIFICANCE
	MEAN	SD	MEAN	SD			
BEFORE BLOCK	85.33	14.92	84.45	15.03	-0.877	0.796	NS*
JUST AFTER BLOCK	91.88	15.21	90.21	14.90	-1.664	0.627	NS*
BEFORE TOURNIQUET	90.05	12.37	83.84	13.93	-6.208	0.040	S*
AFTER TOURNIQUET	90.23	11.38	85.26	12.10	-4.962	0.065	NS*
10 MINUTES	92.20	14.89	86.87	12.59	-5.332	0.092	NS*
20 MINUTES	92.00	12.71	89.13	9.83	-2.868	0.270	NS*
30 MINUTES	89.00	11.66	93.29	10.74	-4.289	0.095	NS*
40 MINUTES	91.30	10.55	96.18	11.39	-4.884	0.090	NS*
50 MINUTES	91.27	11.51	96.74	10.96	5.462	0.085	NS*
60 MINUTES	91.37	10.83	97.21	8.92	5.836	0.076	NS*



BLOOD PRESSURE (SYSTOLIC)

TIME(MINS)	GROUP A		GROUP B		MEAN DIFFERENCE	P VALUE	SIGNIFICANCE
	MEAN	SD	MEAN	SD			
BEFORE BLOCK	123.00	12.07	122.05	11.64	-0.947	0.725	NS*
JUST AFTER BLOCK	131.38	12.34	129.71	12.10	-1.664	0.549	NS*
BEFORE TOURNIQUET	124.93	11.63	119.63	9.92	-5.293	0.034	S*
AFTER TOURNIQUET	125.35	11.16	119.95	10.07	-5.403	0.028	S*
10 MINUTES	127.00	11.21	123.61	9.08	-3.395	0.147	NS*
20 MINUTES	126.75	10.05	127.37	8.72	0.618	0.773	NS*
30 MINUTES	126.55	11.21	132.24	8.34	5.687	0.013	S*
40 MINUTES	125.48	11.11	133.16	8.49	7.683	0.001	S*
50 MINUTES	126.92	10.81	134.58	7.33	7.654	0.005	S*
60 MINUTES	128.50	10.06	134.82	6.98	6.316	0.002	S*

TIME(MINS)	GROUP A		GROUP B		MEAN DIFFERENCE	P VALUE	SIGNIFICANCE
	MEAN	SD	MEAN	SD			
JUST AFTER SURGERY (P1)	127.00	11.21	123.61	9.08	-3.395	0.147	NS*
30 MINUTES (P2)	126.75	10.05	127.37	8.72	0.618	0.773	NS*
60MINUTES (P3)	131.38	12.34	129.71	12.10	-1.664	0.549	NS*
90 MINUTES (P4)	127.00	11.21	123.61	9.08	-3.395	0.147	NS*
120 MINUTES (P5)	123.00	12.07	122.05	11.64	-0.947	0.725	NS*

DISCUSSION
- FROM OUR STUDY WE CONCLUDE THAT:
- THERE WAS SIGNIFICANT DIFFERENCE IN BLOOD PRESSURE BETWEEN THE TWO GROUPS AT 30, 40, 50 AND 60 MINUTES AFTER THE TOURNIQUET INFLATION.
- THERE WAS NON- SIGNIFICANT DIFFERENCE IN HEART RATE BETWEEN THE TWO GROUPS IN ALL POINT OF TIME.
- POST-OPERATIVELY, DURING THE STUDY TIME FRAME THE MEAN VAS SCORE IN BOTH THE GROUPS WAS LESS THAN 4, AND WAS STATISTICALLY NON-SIGNIFICANT.
- THERE WAS NO ADVERSE EFFECT ASSOCIATED WITH LOW DOSE OF KETAMINE.

LIMITATIONS:
- POTENTIAL FOR BIAS MAY EXIST DURING BLINDING.
- STUDY CONDUCTED ON NORMAL PATIENTS SO RESULT CANNOT BE EXTRAPOLATED TO PATIENT WITH HYPERTENSION OR OTHER CO-MORBIDITIES.
- IDEALLY INVASIVE BP MONITORING WOULD HAVE BEEN MORE INFORMATIVE TO CAPTURE MORE FREQUENT BP READINGS.

CONCLUSION
- AFTER CLINICALLY STUDING THE EFFECT OF LOW DOSE KETAMINE (0.25MG/KG BODY WEIGHT) IN PATIENTS UNDERGOING UPPER LIMB SURGERIES USING TOURNIQUET UNDER BRACHIAL PLEXUS BLOCK FOLLOWING CONCLUSIONS WERE DRAWN:
- A SOUND ANATOMICAL KNOWLEDGE OF THE BRACHIAL PLEXUS IS NECESSARY FOR PROVIDING ANAESTHESIA FOR SURGERIES OF THE UPPER EXTREMITIES.
- THE LOCAL ANAESTHETIC ROPIVACAINE IN THE CONCENTRATION AND VOLUME USED WAS SAFE AND EFFECTIVE FOR PROVIDING ANAESTHESIA AND ANALGESIA WITHOUT ANY SIGNIFICANT NEUROLOGICAL, CARDIOVASCULAR OR RESPIRATORY DISTURBANCES.
- THE BLOOD PRESSURE CHANGE DUE TO THE USE OF TOURNIQUET CAN BE PREVENTED BY USING LOW DOSE KETAMINE (0.25MG/KG).
- THE ADVERSE EFFECT ASSOCIATED WITH USUAL DOSE KETAMINE IS NOT SEEN WITH THE USE OF LOW DOSE KETAMINE (0.25MG/KG).

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