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Original Research

A comparative study of general anesthesia, spinal anesthesia and epidural anesthesia on pain following lower limb amputation

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***ABSTRACT*:**
Background: Different pathologic processes such as phantom sensations, phantom limb pain, and stump pain usually develop after lower limb amputation surgery. The present study compared general anesthesia, spinal anesthesia and epidural anesthesia in pain following lower limb amputation.
Materials & Methods: The present study was conducted on 69 patients with American Society of Anesthesiologists physical status I to III scheduled for lower limb amputation. Group I patients received general anesthesia, group II patients received spinal anesthesia and group III patients received epidural anesthesia. Pain intensity was assessed on a numeric rating scale (NRS) of 0 to 10.
Results: The reason for surgery was trauma in 45, ischemia in 18 and peripheral vascular disease in 6. The difference was significant (P< 0.05). Pain on VAS scale after 1 week of surgery was 4.12 in group I, 4.59 in group II and 5.11 in group III. Phantom limb pain severity was 2.15, 2.34 and 2.57 in group I, II and III respectively. Diabetes was present in 5 in group I, 2 in group II and 4 in group III, hypertension was present in 2 in group I, 3 in group II and 6 in group III. The difference was non-significant (P> 0.05).
Conclusion: Authors found that there was less pain intensity with general anesthesia followed by spinal anesthesia and epidural.
Key words: Amputation, General anesthesia, Spinal anesthesia

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INTRODUCTION

Different pathologic processes such as phantom sensations, phantom limb pain, and stump pain usually develop after lower limb amputation surgery. It has been reported in various trials that the estimated prevalence of phantom pain varies from 49% to 83%. This observed wide range might be due to terminology differences when defining phantom pain, phantom sensations, and stump pain.[1]

Phantom pain and sensations are defined as perceptions ranging from slight tingling to sharp, throbbing pain or aching that patients perceive relating to an extremity or an organ that is physically no longer a part of the body.[2] Limb loss can occur as a result of either removal by surgical amputation or congenital limb absence. It is well known that bothersome sensations are generally perceived after amputation of an arm or a leg, but rarely, may also occur after the removal of a breast or an internal organ. Pain sensation varies from individual to individual.[3]

There have been reports that spinal anesthesia induces severe lightning pain in the lower limbs of patients with

phantom limb pain, tabes dorsalis, or causalgia. The exact mechanism of this bizarre phenomenon is controversial. Some advocate that complete loss of sensory input after spinal anesthesia may decrease the level of inhibition and increase self-sustained neural activity.[4]

Although some risk factors, such as pain before the amputation, cause of amputation, prosthesis use, and years since amputation have been defined, the exact causes of painful and non painful phantom sensations are not known.[5] The present study compared general anesthesia, spinal anesthesia and epidural anesthesia in pain following lower limb amputation.

MATERIALS & METHODS

The present study was conducted in the department of General Surgery and Anesthesiology. It comprised of 69 patients with American Society of Anesthesiologists physical status I to III scheduled for lower limb amputation.

Data related to patient such as name, age, gender etc. was recorded. Patients were divided into 3 groups of 23 each. Group I patients received general anesthesia, group II patients received spinal anesthesia and group III patients received epidural anesthesia. Surgical procedure was performed as per standard guidelines following standardized surgical procedure. Standardized questions were used to assess phantom limb pain, phantom sensation, and stump pain postoperatively. Pain intensity was assessed on a numeric rating scale (NRS) of 0 to 10. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Groups	Group I	Group II	Group III
Technique	Spinal	General	Epidural
Number	23	23	23

Table I shows that group I (23) patients received general anesthesia, group II (23) patients received spinal anesthesia and group III (23) patients received epidural anesthesia.

Table II Reason for surgery

Reason	Number	P value
Trauma	45	
Ischemia	18	
Peripheral vascular disease	6	

Table II, graph I shows that reason for surgery was trauma in 45, ischemia in 18 and peripheral vascular disease in 6. The difference was significant (P< 0.05).

Graph I Reason for surgery

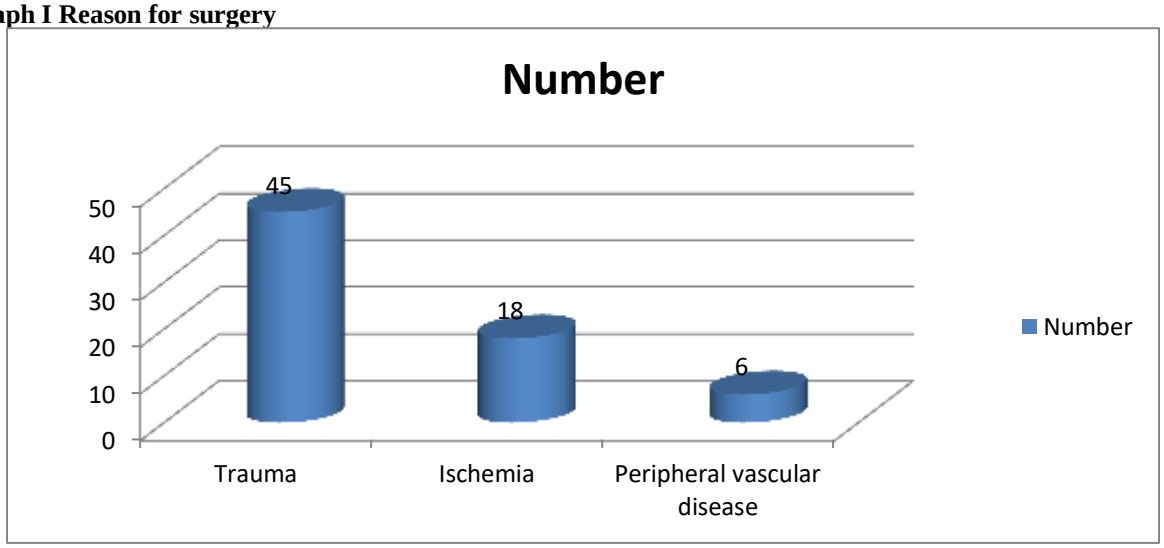
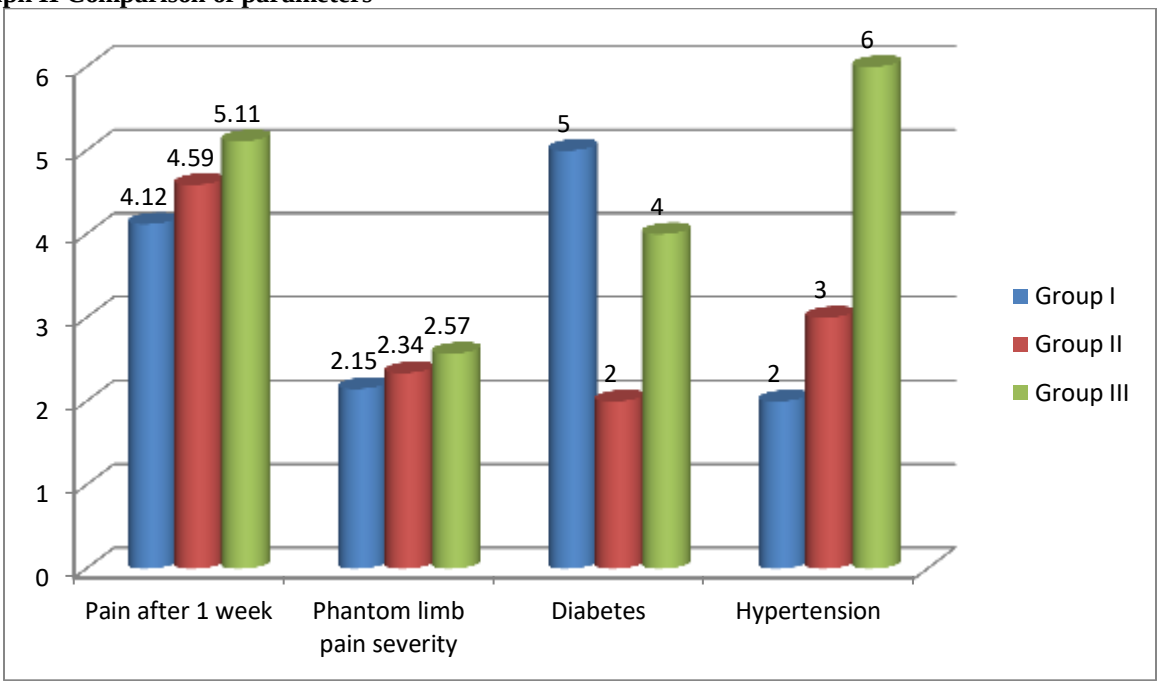


Table III Comparison of parameters

Parameters	Group I	Group II	Group III	P value
Pain after 1 week	4.12	4.59	5.11	0.12
Phantom limb pain severity	2.15	2.34	2.57	0.15
Diabetes	5	2	4	0.62
Hypertension	2	3	6	0.89

Table III, graph II shows that pain on VAS scale after 1 week of surgery was 4.12 in group I, 4.59 in group II and 5.11 in group III. Phantom limb pain severity was 2.15, 2.34 and 2.57 in group I, II and III respectively. Diabetes was present in 5 in group I, 2 in group II and 4 in group III, hypertension was present in 2 in group I, 3 in group II and 6 in group III. The difference was non- significant (P> 0.05).

Graph II Comparison of parameters



DISCUSSION

The mechanism mediating phantom pain and its exacerbation by regional anesthesia is still unclear. The etiology of such a condition may be related to a peripheral or central origin, either spinal or cerebral. Such pain may be generated from active spinal cord cells that are released from inhibitory control through the loss of afferent impulses.[6] After deafferentation, neuronal activity in the affected area of the spinal cord is characterized by spontaneous high-frequency burst activity. These neurons are usually inhibited by somatic sensory input and by projections from reticular formation. Loss of segmental afferent input due to regional anesthesia may decrease the central inhibitory effects on sensory transmission.[7] The release from descending inhibition allows free transmission of abnormal bursting activity, evidenced by exacerbation of phantom limb pain. Counter irritation, either mechanical by percussion or electrical, may produce partial or total relief by increasing the level of inhibitory input. Risk factors for exacerbation of phantom pain after regional anesthesia are poorly understood, since there are few studies addressing this issue. In patients with diabetes and leprosy, spinal instead of epidural anesthesia may constitute risk factors.[8] The present study compared general anesthesia, spinal anesthesia and epidural anesthesia in pain following lower limb amputation.

In present study, group I (23) patients received general anesthesia, group II (23) patients received spinal anesthesia and group III (23) patients received epidural anesthesia.

Jensen et al[9] evaluated the effects of anesthetic techniques on phantom pain, phantom sensations, and stump pain after lower limb amputation. Ninety-two patients with American Society of Anesthesiologists physical status I to III were analyzed for 1 to 24 months after lower limb amputation in this retrospective study.

Patients received general, spinal, or epidural anesthesia or peripheral nerve block for their amputations. Standardized questions were used to assess phantom limb pain, phantom sensation, and stump pain postoperatively. Pain intensity was assessed on a numeric rating scale (NRS) of 0 to 10. Patients' medical histories were determined from hospital records. Patients who received epidural anesthesia and peripheral nerve block perceived significantly less pain in the week after surgery compared with patients who received general anesthesia and spinal anesthesia (NRS [SD] values, 2.68 [1.0] and 2.70 [1.0], respectively). After approximately 14 to 17 months, there was no difference in phantom limb pain, phantom sensation, or stump pain among the anesthetic techniques for amputation.

We found that reason for surgery was trauma in 45, ischemia in 18 and peripheral vascular disease in 6. Pain on VAS scale after 1 week of surgery was 4.12 in group I, 4.59 in group II and 5.11 in group III. Phantom limb pain severity was 2.15, 2.34 and 2.57 in group I, II and III respectively. Diabetes was present in 5 in group I, 2 in group II and 4 in group III, hypertension was present in 2 in group I, 3 in group II and 6 in group III.

Sahin et al[10] conducted a study in which all patients undergone above-the-knee amputation or below-the-knee amputation due to peripheral artery disease between 1996 and 2010 were reviewed to evaluate post-operative opioid consumption and complications. A total of 434 amputations in 323 patients were included in the study. The number of surgical complications, the need for surgical revision and the number of intensive care unit admissions were significantly higher in the general anaesthesia group. The need for post-operative opioid medication was significantly lower in patients with above-the-knee amputation and spinal anaesthesia. The use of post-operative epidural analgesia did not reduce analgesic requirements. In the present study, there were patients who received neuraxial anaesthesia despite abnormal coagulation profile or uninterrupted warfarin or clopidogrel. There were no reported cases of spinal or epidural haematoma.

CONCLUSION

Authors found that there was less pain intensity with general anesthesia followed by spinal anesthesia and epidural.

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