

Original Research Article

Trousseau's sign in orthopedic: a rare sequelae of inadequate postoperative pain management

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ABSTRACT

Background: Pain management in orthopedic is very crucial matter to handle, which is many a times not managed properly and that leads to various medical complications to the patients. Trousseau sign of latent tetany is a medical sign observed in patients with low calcium. This is the first and one of a kind case series describing the development and pathogenesis of Trousseau sign in orthopedics.

Methods: This is a case series of 5 patients with lower limb fractures who underwent surgery. All these patients developed Trousseau's sign in immediate postoperative period. All the patients were investigated and were diagnosed with respiratory alkalosis. They were managed with closed bag ventilation which relieved the symptoms.

Results: Here we put forward a direct physiological and psychological relation between a low pain threshold and associated hyperventilation with lead to development of Trousseau's sign in our patients. So, next time in postoperative round, if we see patient hyperventilating and complaining about fixed hand's position, do not start calcium gluconate drip immediately, it may be due to respiratory alkalosis, then closed bag ventilation would be suffice.

Conclusions: Trousseau's sign seen postoperatively in Orthopedics may be commonly due to inadequate pain management rather than altered calcium metabolism.

Keywords: Pain management, Fractures, Trousseau's sign, Calcium metabolism, Respiratory alkalosis

INTRODUCTION

Pain management in Orthopedic is very crucial matter to handle which is many times not managed properly and that leads to various medical complications to the patients. Pain perception is depends on age, sex and psychological status of the patients.¹

Inadequately managed post operative pain to the patients lead to physiological changes that may be present as Respiratory Alkalosis.² We are here presenting an interesting case series that represents such a rare complication of inadequately managed post operative pain in orthopedic ward.

Trousseau sign of latent tetany is a medical sign observed in patients with low calcium. The causes of the same are acute hyperventilation, psychogenic hyperventilation, magnesium deficiency, thrombophlebitis, hypoparathyroidism, malignant neoplasm of pancreas, barter disease and Gitelman diseases. The patient typically develops flexion in wrist and MCP joint, extension of IP joint and adduction of thumbs and fingers. A lot has been described about this sign in various literature, however none of the literatures describe the development of Trousseau sign in post operative patients and its importance as inadequately managed post operative pain in the field of orthopedics. Here we find an association of this sign in post operative patients with lower limb fractures. This is the first and one of a kind case series

describing the development and pathogenesis of Trousseau sign in Orthopedics (we called it the ‘civil sign’).

METHODS

This is case series of 5 patients reported at Civil Hospital, Ahmedabad from January 2017 to January 2018. All the patients had lower limb fracture for which each patient underwent surgery. Trousseau sign developed in these patients in the post operative period during the same day of operation.

All patients were investigated preoperatively as per routine protocol for preoperative evaluation like complete blood count, blood chemistry, serology, renal and liver function tests and all patients had normal preoperative investigation.

Patients were taken for operation ranging from day 2 to day 3 after trauma and all were operated under spinal anesthesia.

All patients had not been adequately managed for their post operative pain. Since pain perception is depend on age, sex and various other psychological factors, all patients should be managed individually as per their pain threshold.

When Trousseau sign developed in these patients immediately all blood investigation like CBC, RFT, serum Na⁺, K⁺, Ca⁺, Mg²⁺, PTH level and ABGA were sent. An urgent opinion of the medicine team was taken and immediately Calcium gluconate drip was started as per their advice since they suspected hypocalcemia on seeing Trousseau sign. But to no avail.

All post op reports post development of Trousseau sign were normal Except ABGA (arterial blood gas analysis). ABGA of these patients showed respiratory alkalosis, which was the cause of Trousseau's sign. Following which a closed paper bag ventilation was given, and Trousseau’s sign was relieved approximately avg. 20-30 min after that.

RESULTS

This is case series of 5 patients in civil hospital Ahmedabad of which 3 were female and 2 were male.

Table 1: Patient details.

Patient no	Sex	Age	Fracture type
1	Male	34	Right side shaft femur
2	Female	22	Right side subtrochanteric femur
3	Male	32	Light side femur
4	Female	25	Right side femur
5	Female	30	Light side femur

This all patient has normal serum magnesium and serum total calcium level during attack of trousseau’s sign in post operative period.

Table 2: Serum calcium and magnesium levels of patients.

Patient no	S. Total Calcium level	S. Magnesium level
1	9.1	1.8
2	9.5	2.2
3	9.7	2.3
4	8.9	2.0
5	9.8	2.4

All those patients work up was done and on ABGA all those patient has found respiratory alkalosis.

Table 3: ABGA analysis of each patient.

Patient no.	pH (7.35-7.45)	Pco2\ (38-42 mm hg)	Hco3- level (22-28 mEq/l)
1	7.60	33	30
2	7.50	31	32
3	7.55	32	31
4	7.66	30	34
5	7.59	32	30

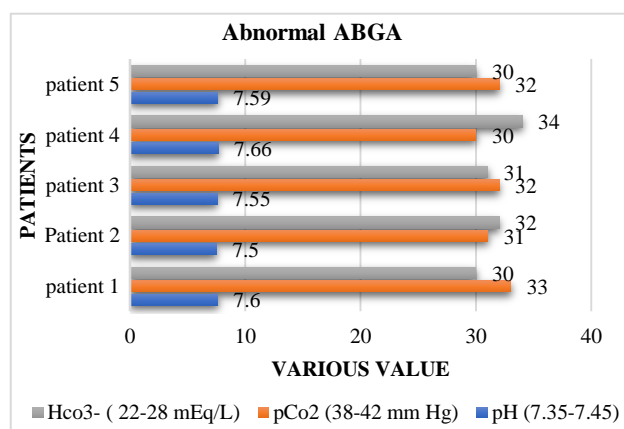


Figure 1: Graphical presentation of each patient’s pH, pCo2 and Hco3.

If we put post operative period on x axis and various patients on y axis and make graph and mark linear line to indicate period of trousseaus attack then it looks like this.

Figure 2 shows that all 5 patients of our case series had normal level of ionized calcium, magnesium level and in spite of it, patients developed Trousseau’s sign. ABGA of all patients were suggestive of respiratory alkalosis. Alkalosis promotes the binding of calcium to albumin and can reduce the fraction of ionized calcium in the blood, and ionized calcium may reduce without changes in total calcium and patient developed Trousseau’s sign. So although drip of calcium gluconate, oxygen was

started immediately after attack of this sign but, was to no avail. After the serum calcium levels were found to be normal and ABGA shows respiratory alkalosis, it struck that it was due to pseudohypocalcemia due to inadequately managed post op pain induced hyperventilation. So as a treatment rebreathing in paper bag was given. Following which symptoms of hypocalcemia were dramatically relieved after 30-40 min of it.

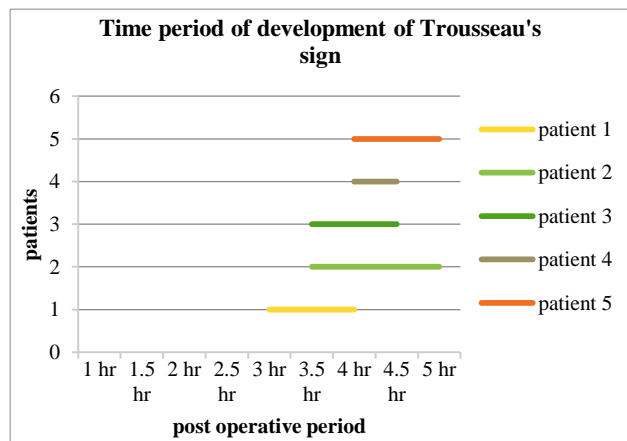


Figure 2: Development and weaning of trousseaus sign in postoperative time period.

Table 4: Development and weaning of trousseaus sign in postoperative time period.

Patient Number	Postoperative hours after which Trousseau's sign developed. (Hours)	Trousseau's sign is relieved in how much time after giving rebreathing in a paper bag
1	4.5	30 min
2	3.5	35 min
3	3	38 min
4	3.5	40 min
5	4	32 min

The cause of respiratory alkalosis was raised respiratory rates due to pain and apprehension that developed after weaning off anesthesia (spinal anesthesia) which was given for operative purpose of lower limb fractures.

DISCUSSION

Pain, swelling and deformity are the main signs and symptoms of any fracture. Of which pain is persistent symptoms associated with any trauma and is generally more severe with long bone fractures in any conscious patient. Pain is the body's natural response when a bone breaks. Different people has different threshold for pain.³ Pain often lead to anxiety, apprehension and various physiological signs like changes in blood pressure and heart rate, increased respiration rate and/or depth, pilo-erection, changes in skin and body temperature, increased

muscle tone, sweating. Pain induced anxiety also has role in overall recovery of the patient.⁴ All these signs associated with pain develop when a person's threshold to bear pain is passed and hence the development of these signs vary from person to person since everyone has a different threshold for pain. So analgesics dosage needs to relieve the pain is vary among people.⁵ And pain management on the day of operation and immediate post op day has very crucial role.



Figure 3: Clinical image showing flexion at wrist, MCP joints, extension at IP joints and adduction of all fingers/thumbs.

Increase in the respiratory rate and its depth is one of the important sign since respiratory rate is associated with the regulation of the acid-base balance to maintain the body's homeostasis.⁶ An increased depth and rate of respiration generally doesn't alter body's acid base balance because all that respiratory alkalosis which develops because of the increased respiratory rate and the carbon dioxide washout is compensated by metabolic acidosis.⁷ However sometimes when it is not compensated it will lead to symptomatic respiratory alkalosis.⁸ Trousseau's sign is a sign (photograph showing the same) of latent tetany as described in various literature.⁹ The components of Trousseau's sign include Flexion in wrist and MCP joint, Extension of IP joint & Adduction of thumbs and fingers. Trousseau sign of latent tetany is a medical sign observed in patients with low calcium. Various other conditions which lead to Trousseau's sign include acute hyperventilation, psychogenic hyperventilation, magnesium deficiency, thrombophlebitis, hypoparathyroidism, malignant neoplasm of pancreas, barter disease and Gitelman diseases.

In our study those patients which had maybe a relatively lower threshold for pain or were apprehensive preoperatively were found to develop more sign of pain and apprehension post operatively. Both pain, anxiety and apprehension were associated with an increase of respiratory rate with carbon dioxide washout which led to respiratory alkalosis.¹⁰ When this continued for a longer time the body tried to compensate it by binding of the ionized calcium with albumin and there by maintaining the homeostasis.¹¹ When the pain was still persistent the

patient developed this Trousseau sign. Here we put forward the flow chart of pathogenesis of Trousseau sign

in patients of lower limb fractures who were inadequately managed for their postoperative pain.¹²

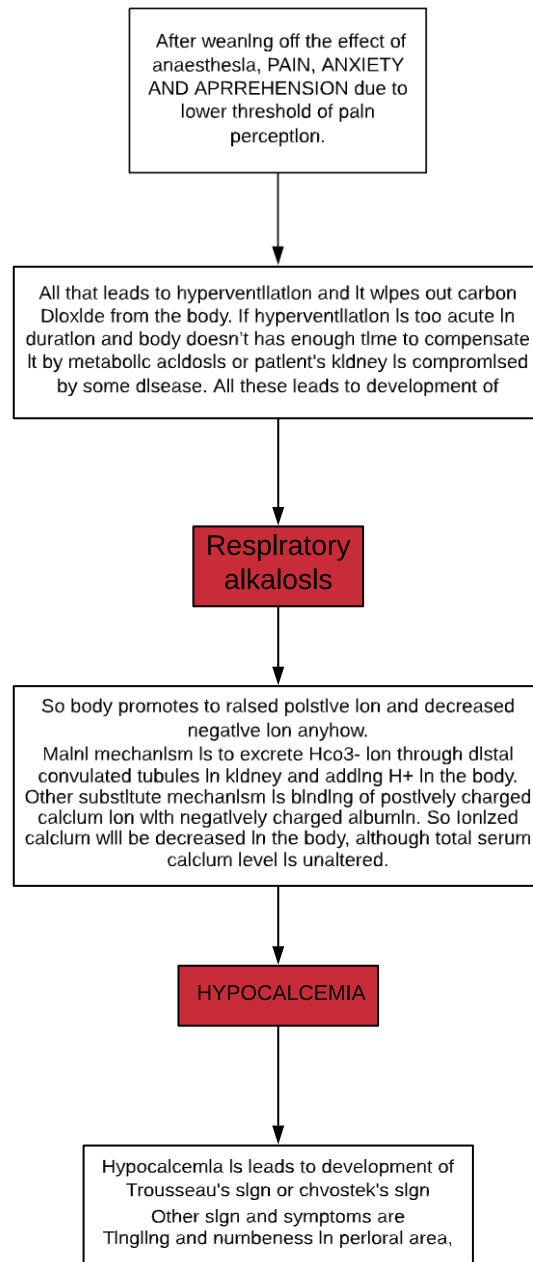


Figure 4: Flowchart explaining core mechanism of development of Trousseau's sign in hyperventilation.

All these patients were managed with analgesics, paper bag ventilation and anxiolytic which helped to relieve pain and also calm the respiratory rate. The paper bag ventilation helped to increase the relative saturation of carbon dioxide in the body and thereby help in compensation of the respiratory alkalosis. All the patients recovered within 30 to 40 minutes with this management.

CONCLUSION

This short case series concludes that although Trousseau's sign is very well accepted medical sign of

hypocalcemia but it is also seen in orthopedic surgical side with normal serum total calcium level. As pain of lower limb fractures are severe in nature, patients tend to develop apprehension and anxiety in immediate postoperative weaning of anesthesia if not managed properly and developed Trousseau's sign. A proper understanding and management of which is required.

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Conflict of interest: None declared

Ethical approval: The study was approved by the institutional ethics committee

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