Metabolic Risk Factors as a Causative Factor for Rib and Sternal Fracture Non and Malunion: A Multi-Institutional Collaborative Study

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Background and Rationale

- The role of metabolic health has been well established for fracture healing in the orthopedic literature.
- Patient dependent factors such as metabolic diseases and nutritional deficiencies have not been similarly investigated in rib and sternal fractures.
- A high proportion of the patients developing nonunion or malunion have metabolic compromise, especially vitamin D deficiency, menopause, thyroid disorders, and calcium deficiency which can be secondary to gastrointestinal malabsorption or hypothyroidism.
- **Poor fracture healing can be classified into two categories, malunion and nonunion. Malunion** occurs when a fractured bone heals in an abnormal position.
- **Nonunion** is a fracture that has failed to heal after a prolonged period. In general, nonunion fractures are difficult to treat and have high financial impact such as loss of productivity
- This study will examine the relationship between non/malunion rib and sternal fractures and metabolic factors. It will examine the correlation of the fracture healing with correction of metabolic factors.

Primary and Secondary Aims

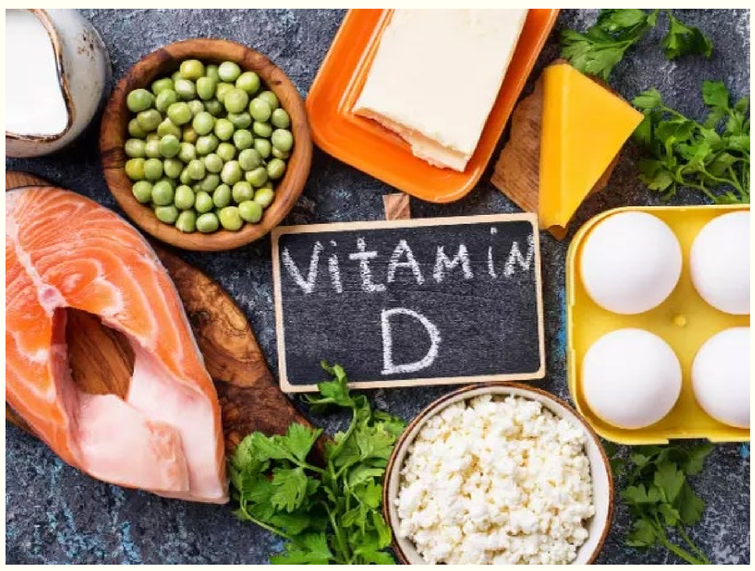
- **The primary objective** is to examine the relationship between non/malunion thoracic (rib and sternal) fracture and metabolic factors.
- **Secondary objectives** include correlation of fracture healing with correction of metabolic abnormalities and if Surgical Stabilization of Rib Fractures/Surgical Stabilization of Sternal Fractures (SSRF/SSSF) affects rates of fracture healing.

Study Conduct

This is a multicenter, retrospective analysis of deidentified data from participating site's trauma registries and medical records. All datapoints in the registries will be collected based on the National Trauma Data Standard as published by The American College of Surgeons.

Saint Francis Hospital will be working in partnership with Westchester Medical Center + 41 other hospitals as part of a Chest Wall Injury Society (CWIS) Collaborative research effort.

The Chest Wall Injury Society (CWIS) is a medical society that focuses on the science of chest wall injury and the surgical stabilization of rib fractures. It has a unique collaborative center program which **Saint Francis Hospital has been a member of since 2021.**

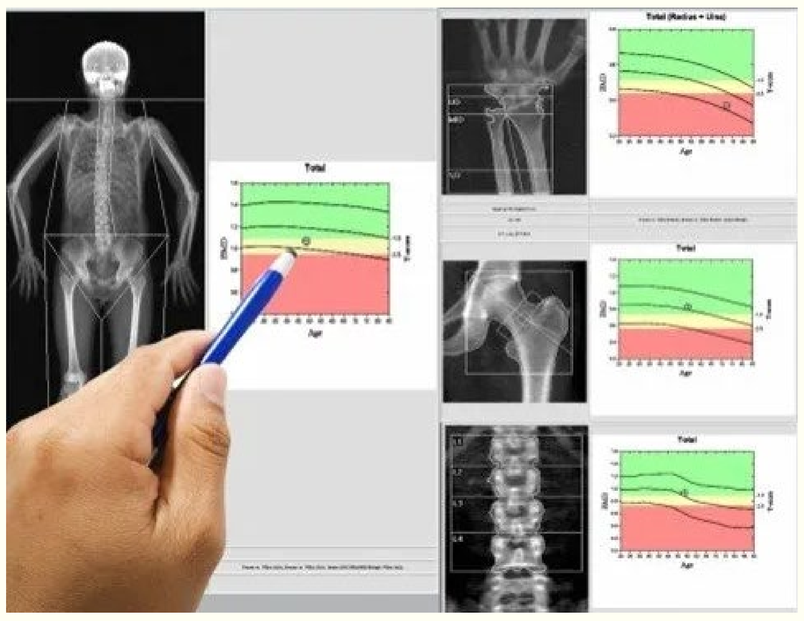


Main Study Outcome Measures

Primary outcome measures:
Rate of metabolic abnormalities in the non/malunion population.

Secondary outcome measures

- SSRF/SSSF non/malunion rate.
- Improvement with correction of metabolic abnormalities.
- Need for SSRF/SSSF for treatment.



References

1. Karpouzos A, Diamantis E, Farmaki P, Savvanis S, Troupis T. Nutritional Aspects of Bone Health and Fracture Healing. J Osteoporos. 2017;2017:4218472. doi: 10.1155/2017/4218472. Epub 2017 Dec 31. PMID: 29464131; PMCID: PMC5804294

2. Van Wijck SFM, Van Lieshout EMM, Prins JTH, Verhofstad MHJ, Van Huijstee PJ,Vermeulen J, Wijffels MME. Outcome after surgical stabilization of symptomaticrib fracture nonunion: a multicenter retrospective case series. Eur J TraumaEmerg Surg. 2022 Aug; 48(4):2783-2793. doi: 10.1007/s00068-021-01867-x.Epub 2022 Jan 27. PMID: 35088110; PMCID: PMC9360056.