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Management of Radius Non-Union with In-Situ Square Nail and Fresh Ulna Fracture with Positive Ulnar Variance: Dual Bone Plating and the Novel Use of an Ulna Strut Graft for Radius Non-Union and Simultaneous Ulnar Variance Correction—A Case Report

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ABSTRACT

Introduction: Radius non-union in the presence of prior hardware, along with a fresh ulna fracture and positive ulnar variance, presents a complex challenge. Correcting ulnar variance is essential for addressing wrist pain and restoring normal forearm biomechanics.

Case Report: We present the case of a 60-year-old female who sustained a right forearm injury following a slip. She had a square nail inserted into the radius 15 years ago, which contributed to non-union. The recent trauma resulted in a fresh fracture of the ulna shaft and positive ulnar variance, contributing to wrist pain. The surgical intervention involved the removal of the square nail, ulna shortening, and plate fixation of both the ulna and radius. The radius non-union was treated by freshening the bone edges, and an ulnar strut graft harvested from the shortened ulna was used to prevent radius shortening, stabilize the non-union and to simultaneously correctthe positive ulnar variance.

Conclusion: This case illustrates a comprehensive approach to managing radius non-union with prior hardware, combining radius and ulna plating with ulna shortening and using the same ulnar strut graft to prevent further radius shortening, to correct the ulnar variance and to helprestore stability to the forearm.

1. INTRODUCTION

Radius non-union is a complex condition that may occur due to a variety of factors, including previous hardware placement, inadequate healing, or biomechanical stress. When non-union is compounded by additional injuries, such as a fresh ulna fracture and positive ulnar variance, the treatment approach must address multiple challenges simultaneously. In cases where ulnar variance is positive, patients can experience significant wrist pain due to the altered biomechanics of the distal radioulnar joint (DRUJ). Surgical correction of ulnar variance and stabilization of non-union, especially with prior hardware involvement, requires a tailored approach.

In this case report, we present a 60-year-old female with a history of radius non-union due to a square nail inserted 15 years ago. A recent slip resulted in a fresh ulna shaft fracture and exacerbated positive ulnar variance. The surgical approach included hardware removal, ulna shortening, plate fixation of both bones, and the use of the same ulnar strut graft to prevent radius shortening and to correct ulnar variance, which successfully addressed the patient's clinical presentation.

2. CASE PRESENTATION

A 60-year-old female presented with pain and swelling in her right forearm following a slip 20 days prior. She reported a history of a square nail insertion into her radius 15 years ago due to a previous fracture. The patient noted that over the past few years, she had experienced intermittent pain in her wrist, which had worsened following the fall. Clinical examination revealed tenderness, swelling, and limited range of motion in the forearm and wrist. Radiographs demonstrated a non-union of the radius with the square nail still in situ, along with a fresh fracture of the ulna shaft. Additionally, the patient had positive ulnar variance, which was contributing to her wrist pain.

The decision was made to proceed with surgical intervention. Under Brachial Block, the square nail was carefully removed from the radius. The edges of the radius were freshened to stimulate healing at the non-union site. Next, ulna shortening was performed to correct the positive ulnar variance. A plate was applied to the ulna for stabilization. Additionally, a plate was used to stabilize the radius, which had previously been fixed with the square nail. To prevent radius shortening and provide structural support, an ulnar strut graft was harvested from the shortened ulna and placed in the radius.

Postoperatively, the patient was placed in a splint for immobilization and instructed to follow up for rehabilitation and monitoring of bone healing.

Figure 1

Figure 2

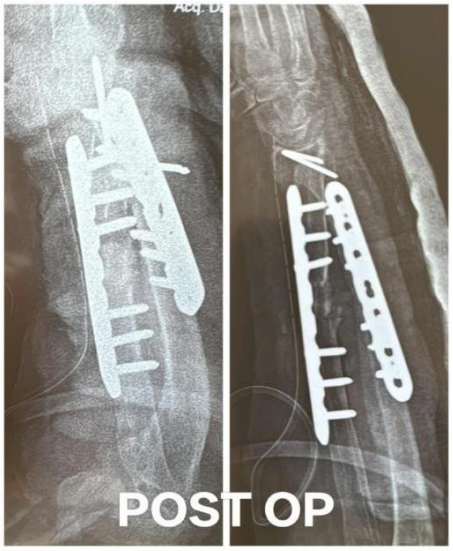

Figure 3.

Figure 4

3. DISCUSSION

Radius non-union, especially in the context of previous hardware placement, poses a significant challenge in orthopaedic practice. In this case, the patient had a square nail placed in the radius 15 years ago, which likely contributed to delayed healing and non-union. The recent trauma caused a fresh ulna fracture, complicating the scenario further with positive ulnar variance, which exacerbated wrist pain due to altered forearm biomechanics. Positive ulnar variance is known to cause impingement at the distal radioulnar joint (DRUJ), leading to pain, limited mobility, and functional impairment.

The combination of ulna shortening and plate fixation in this case addressed both the fresh fracture and the positive ulnar variance. By correcting the ulnar variance, the wrist biomechanics were restored, providing relief from the DRUJ-related symptoms. The use of a plate on the ulna ensured stable fixation of the fresh fracture, allowing for proper healing. Similarly, plating of the radius was performed after removing the square nail and freshening the non-union site to promote bone healing.

An innovative aspect of this surgical approach was the use of an ulnar strut graft harvested from the shortened ulna. By using this graft to prevent radius shortening, the procedure avoided further complications related to length discrepancies, which could have caused additional functional issues. Strut grafts are commonly used to provide structural support in long bone non-unions, and their application in this case contributed to the successful stabilization of the radius.

The surgical technique applied here represents a combination of hardware removal, fresh fracture management, correction of biomechanical anomalies, and the use of autografts to enhance healing and stability. Previous reports of radius non-union management often highlight the challenges of addressing prior hardware while also achieving stable fixation and optimal healing. In this patient, the combination of radius plating, ulna shortening, and strut grafting achieved these objectives, offering an approach that could be beneficial in similar cases.

4. CONCLUSION

This case report highlights a comprehensive surgical approach to managing a complex forearm injury involving radius non- union with prior square nail placement, a fresh ulna fracture, and positive ulnar variance. By combining hardware removal, ulna shortening to correct ulnar variance, and the use of an ulnar strut graft, the surgical team was able to restore forearm stability and wrist function while addressing the patient's pain and biomechanical concerns. This approach demonstrates the value of individualized treatment plans that address both bone healing and functional restoration in cases of non-union with additional fractures

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