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Case Report

# Muscle Pedicle Bone Grafting for Non-Union Neck of Femur in a Young Patient - A Successful Outcome

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## Abstract

Non-union of the femoral neck in young patients presents a significant treatment challenge. In this case, a muscle pedicle bone graft using the quadratus femoris was employed to treat a non-union femoral neck fracture after failed conservative treatment. The procedure resulted in complete fracture healing and full functional recovery at six months postoperatively, as confirmed by radiological and clinical assessments. This case highlights the effectiveness of muscle pedicle bone grafting as a valuable option for managing non-union femoral neck fractures in young patients, offering a promising alternative when standard treatments are unsuccessful.

**Keywords:** Muscle Pedicle; Bone Grafting; Femur; Young Patient

## Introduction

This is a case of a 20-year-old lady who presented with pain in the left groin following injury (fall from bike), and inability to bear weight on left lower limb 5 months ago. She was initially taken to a local Orthopaedic doctor where she was treated conservatively, later came to us with persistent symptoms.

Clinically there is tenderness over the groin with terminally restricted rotations. Limping gait with Trendelenberg test positive. Fixed flexion of 90°, near normal abduction, painful adduction and a limb shortening of 2 cms.

## Investigations

Plain radiographs and bone scan of the affected hip show intact fracture line at the subcapital region of neck of left femur with intact vascularity (Figure 1).


**Figure 1:** Pre-operative radiograph showing non-union of neck of left femur.

## Procedure

Under spinal anaesthesia, lateral position, standard preparation and draping. Intravenous antibiotic (Inj. Cefuroxime 1.5gm) given before incision. Incision given via posterior approach, sciatic nerve is protected, and short external rotators identified. Quadratus femoris identified and bone but marked. 3x1x1cm bone with muscle pedicle separated and kept protected. Capsule opened with inverted T cut. Fracture nonunion identified with complete fibrous tissue and gap over superior and anterior part of fracture. Debris debrided to bone. Pepper potting done on both the neck and head. Bone graft harvested from greater trochanter and implanted into the defect in the head (Figure 2). Fracture reduced and fixed with 3x7mm cannulated cancellous screws with threads passing beyond the fracture site. No penetration into the joint on continuous screening under II (Figure 3). Trough created over posterior aspect of neck and head and muscle pedicle fixed with a 4mm cannulated cancellous screw. Short external rotators and capsule repaired. Wound washed and closed with No 2 Ethibond to fascia, 2/0 vicryl to fat and monocryl subcuticular to skin. Periarticular tissues infiltrated with 40ml of 0.25% Bupivacaine. G dress and pressure dressing applied.

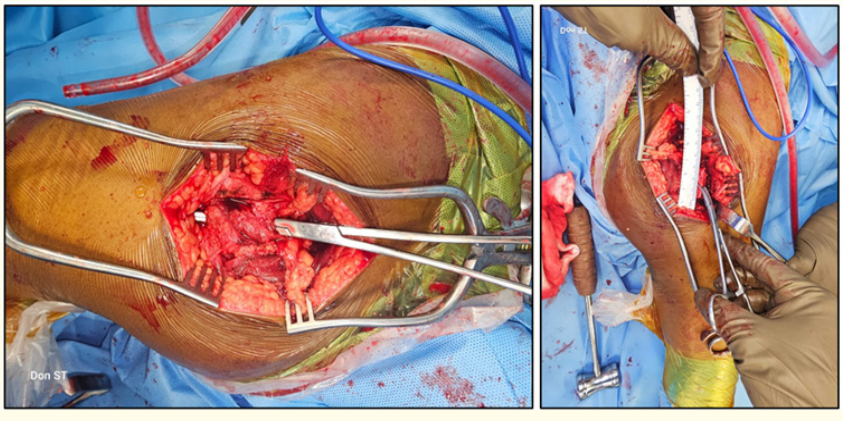


**Figure 2:** Intra-operative images showing graft harvest.

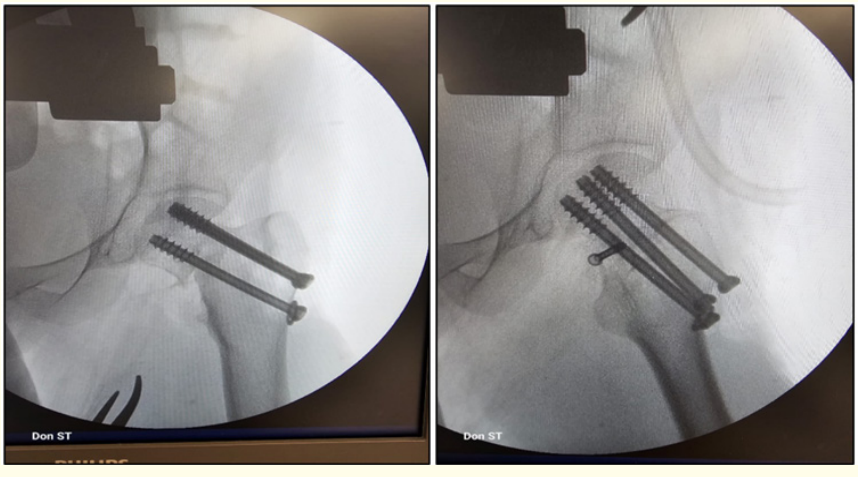


**Figure 3:** Intra-operative radiographic images.

Postoperatively, partial weight bearing (20% body weight) started immediately along with static and dynamic quadriceps strengthening exercises and ankle pumps.

Postoperative radiographs at 9 months showed remodeling at fracture site with no changes of AVN of the femoral head (Figure 4). Clinically she had near normal range of motion of hip, and she was able to do all the activities of daily living. Harris hip score was 92.60 which showed a significant improvement compared to pre operative score of 14.30.

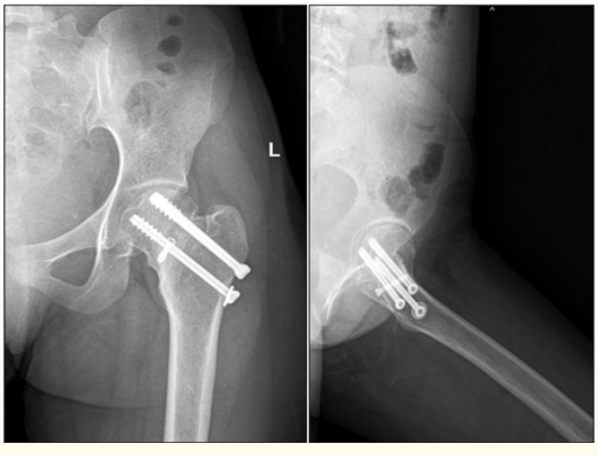


**Figure 4:** 9 months post operative antero-posterior and lateral X rays.

## Discussion

Non-union of femoral neck fractures in adolescents is rare but represents a significant challenge due to the high risk of avascular necrosis (AVN) and complications associated with inadequate healing. Standard treatment options typically involve internal fixation or valgus osteotomy, but these approaches can fail in cases of persistent non-union. In this case, the use of a muscle pedicle bone graft (MPBG) from the quadratus femoris offered a successful alternative, demonstrating complete fracture healing and functional recovery.

The muscle pedicle bone graft not only provides biological enhancement to the healing process but also helps in revascularizing the femoral head, which is critical in preventing AVN. In our case, radiographs taken at 9 months postoperatively showed clear evidence of fracture remodelling without signs of AVN. This outcome is consistent with findings from similar studies, [1,2] which documented high rates of success with MPBG in treating non-unions.

In 1962, the autogenous muscle pedicle graft based on the quadratus femoris muscle was used for the first time. Later, fresh autogenous cancellous iliac bone chips combined with muscle pedicle bone grafting have been reported to be good.

Muhammed., *et al.* [1] achieved radiological union and reported excellent functional outcomes, including the ability to perform activities such as squatting and sitting cross-legged in all the 5 cases included in their study with an average follow-up period of 130 weeks and radiological union occurring at an average of 6.5 months.

Rhatomy., *et al.* [2] studies 4 patients with neglected femoral neck fractures, all underwent cannulated screws fixation and osteomuscular pedicled graft using sartorius muscle. All patients achieved bone healing after 6-months of follow-up. They concluded that sartorius muscle pedicle graft may be a good choice for treating neglected femoral neck fractures.

Govind Mohan Jee., *et al.* [3] studies on sixteen patients with ununited fracture neck of femur (presenting late) in children and adolescents were treated with quadratus femoris based muscle pedicle bone graft along with open reduction and internal fixation. Mean age of the patient was 14.25 year (range 12-16 years). Most of the cases showed union in 16 to 24 weeks. In one case there was implant failure. The result was analysed using Harris Hip Score which showed - 11 (68.75%) excellent, 2 (12.50%) Good, 2(12.50%) Fair and one (06.25%) Poor results.

Manjunath., *et al.* [4] presented a case report on a 10-year-old female with nonunion neck of left femur and reported excellent functional outcome with Quadratus femoris based muscle pedicle bone graft and screw fixation.

Sarabjeet., *et al.* [5] in a case series of seven cases, in a short term follow up shows excellent results of 86% with favourable outcome.

Yipeng Wu., *et al.* [6] in a systematic review of 20 articles including 1022 patients shows average effective rates were as follows: good, 73.4%; fair, 15.4%; and poor, 10.9%. Moreover, the average non-union rate, average avascular necrosis rate, average collapse rate, and the overall reoperation rate were 9.0%, 6.7%, 4.7%, and 7.3%, respectively.

Despite the favourable outcome, the limitations of this approach should be acknowledged. Muscle pedicle grafting is technically demanding and requires meticulous surgical technique to ensure adequate graft viability. Furthermore, long-term studies are needed to evaluate the durability of the repair, particularly in terms of hip joint function and the risk of late-onset AVN.

## Conclusion

The use of muscle pedicle bone grafting (MPBG) from the quadratus femoris in this young patient with non-union of the femoral neck led to successful fracture healing and full functional recovery. This case supports MPBG as a viable treatment option for non-union femoral neck fractures in adolescents, particularly when standard treatments have failed. The procedure not only aids in fracture union but also promotes revascularization, minimizing the risk of avascular necrosis. While the outcome in this case was favourable, further studies are needed to evaluate long-term outcomes and refine surgical techniques.

## Conflict of Interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

## Compliance with Ethical Requirements

The study adhered to ethical guidelines approved by the institutional review board, and informed consent was obtained from the patient prior to participation.

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