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Delayed neurological deficit in osteoporotic VCF – surgical outcome

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Abstract

Introduction: The International Osteoporosis Foundation has estimated that worldwide, approximately 30%-50% people aged over 50 years are at risk for the development of fragility fractures secondary to osteoporosis. Vertebral compression fractures occur in 20% of people over the age of seventy years and in 16% of postmenopausal women.

The majority of fractures heal with conservative treatment after 8 to 10 weeks. Surgery is indicated for patients who present with neurological deficits, deformities, and incapacitating pain with conservative treatment failure. 2% of patients with OVF's develop cord compression.

This study aimed to identify the clinical presentation and predictors of clinical outcomes among patients operated for delayed neurological deficits after OVF's.

Materials and methods

- 8 cases – 5 female, 3 male,
- Dorsolumbar junction – 7 cases, dorsal spine 1 case.
- Neurological status
 - ASIA B – 1
 - ASIA C – 5
 - ASIA D – 2

All cases underwent posterior short segment fixation (pedicle screws one level above and below the fracture vertebra) and percutaneous vertebroplasty and indirect decompression.

Results and analysis: The average time to onset of neurological deficits was 5.4 weeks from the time of injury. Postoperatively neurology improved upto ASIA grade E – 7, grade D – 1. All patients were followed up with neurological assessment every 2 weeks upto 3 months and every month upto 6 months. One patient could not walk, and seven patients walked with heavy assistance. Two patients had sphincter disturbance. The mean preoperative Baba's score was 5.96. The mean values of LAH (lateral anterior vertebral body height) and LPH (lateral posterior vertebral body height) were 41.0% and 60.7% postoperatively and 37.4% and 58.8% after 6 months post op. The average retropulsion was 36.5%.

Conclusion: Although OVF's are common and generally considered benign, severe and delayed neurological deficits can occur following spinal cord compression. Improved clinical outcomes are associated with compression fractures, less initial retropulsion, lack of surgical complications, and an optimal restoration of retropulsion.

Keywords: Delayed neurological deficit VCF – surgical osteoporosis foundation

Introduction

The International Osteoporosis Foundation has estimated that worldwide, approximately 30%-50% people aged over 50 years are at risk for the development of fragility fractures secondary to osteoporosis. Vertebral compression fractures occur in 20% of people over the age of seventy years and in 16% of postmenopausal women.

The majority of fractures heal with conservative treatment after 8 to 10 weeks. Surgery is indicated for patients who present with neurological deficits, deformities, and incapacitating pain with conservative treatment failure. 2% of patients with OVF's develop cord compression [1, 2].

This study aimed to identify the clinical presentation and predictors of clinical outcomes among patients operated for delayed neurological deficits after OVF's.

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Materials and methods

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Surgical technique

7 cases underwent posterior short segment fixation with pedicle screws one level above and one level below the fractured vertebrae and vertebroplasty PMMA cement injected into the vertebral body after taking core biopsy from the body. Indirect decompression done. Postoperatively neurology improved upto ASIA grade E – 7, grade D – 1.

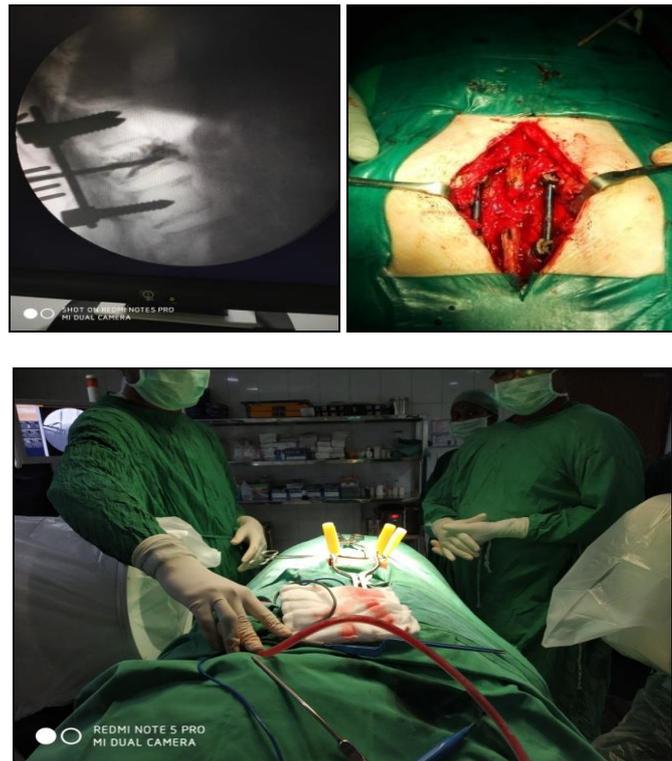


Image 1 & 2: Showing intraoperative PSF and vertebroplasty

Results and analysis

The average time to onset of neurological deficits was 5.4

weeks from the time of injury. One patient could not walk, and seven patients walked with heavy assistance. Two patients had sphincter disturbance. The mean preoperative Baba's score was 5.96. The average retropulsion was 36.5%. The mean values of LAH (lateral anterior vertebral body height) and LPH (lateral posterior vertebral body height) were 41.0% and 60.7% postoperatively and 37.4% and 58.8% after 6 months post op.

Baba Score [3].

Table 2: Baba pain- neurological scoring system of osteoporotic vertebral fracture (Total score=14)

Categories	Score (Point)
Spinal pain (3)	
Incapacitating and uncontrollable	0
Controllable with medication	1
Painful but no medication needed	2
Negligible or absent	3
Motor function of lower extremities (4)	
Impossible to walk	0
Cane or aid on flat ground	1
Aid only on stairs	2
Walk unaided but slow	3
Normal	4
Sensory function (2)	
Trunk	
Apparent	0
Minimal	1
Normal	2
Lower extremity (2)	
Apparent	0
Minimal	1
Normal	2
Bladder function (3)	
Urinary retention or incontinence	0
Severe dysuria (sense of retention)	1
Slight dysuria	2
Normal	3

Post-operative improvement rate was calculated as postoperative score minus preoperative score, divided by 14 minus preoperative score, multiple by 100 and shown in percent. Excellent was defined as improvement ≥ 80 percent; good 50-79 percent; fair 25-49 percent; and poor ≤ 24 percent [7]

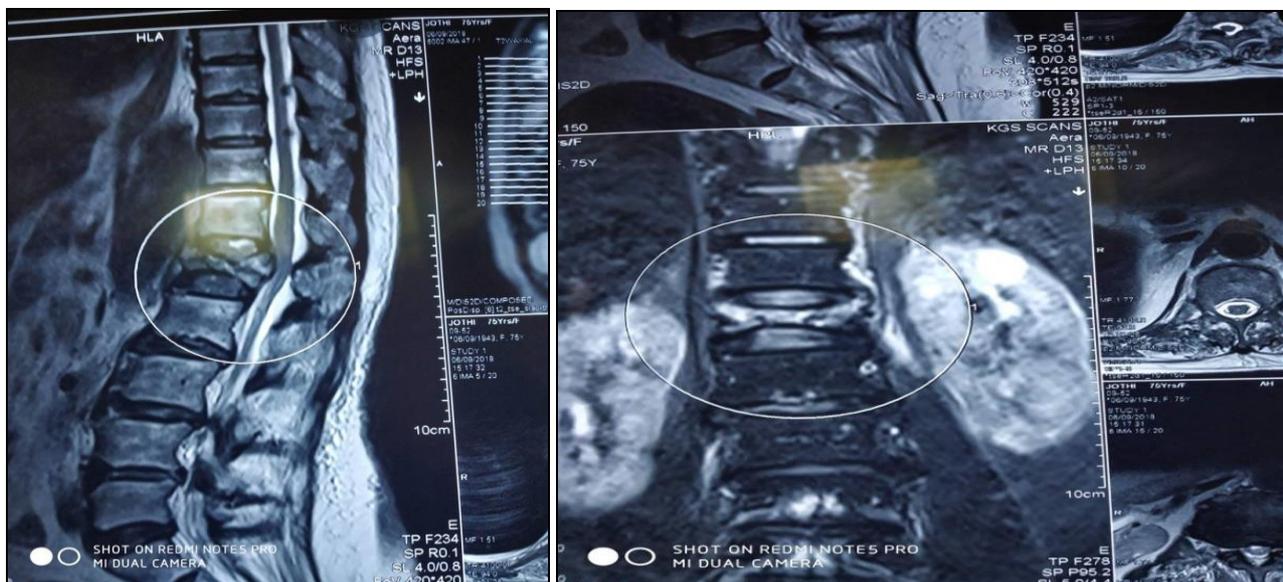




Image 2: Preop and post op picture

Discussion

OVFs may present as neurological deficits due to spinal cord compression. All patients sustained low-energy injuries.

The natural history of VCF is that 30% develop further collapse, 13% go for non-union, and 3% develop neurological deficit as per Taenichi *et al.* [4,5].

Spinal instability: the concept of spinal instability has been recently introduced in the Osteoporotic VCFs, as these fractures were traditionally considered stable and treated with conservative treatment. However, there are certain risk factors when present make these fractures unstable leading onto a progressive collapse, kyphotic deformity and neurological deficit.

The following were considered as the risk factors.

1. Middle column burst fractures were suggested to have a higher risk of neurological deficits because of retropulsed fragments [7]. In a Japanese series, approximately 91% of OVFs causing paraplegia were burst fractures [8].
2. Angular instability of $>15^\circ$ and retropulsion of $>42\%$ were predictive factors for neurological deficits [9].
3. Cobb's angle of $>30^\circ$ was regarded as a precipitating factor in one study [8], and
4. vacuum sign was observed in 22 patients before the onset of neurological deficits in another study (n=28) [9].



Image 3: Showing risk factors of progression.

The goal of treatment in these fractures is

1. Neurological decompression,
2. Kyphotic deformity correction,
3. Stable arthrodesed spine.

Surgery in elderly individuals is associated with high complication rate as Nyguen *et al.* reported a complication rate of 70 %, due to Comorbid conditions, and severe osteoporosis, implant purchase very poor.

The surgical procedures available are

- 1 Direct anterior decompression and reconstruction.
- 2 Posterior column shortening osteotomy and stabilisation, and decompression [11].
- 3 Posterior short segment fixation, decompression and

vertebroplasty.

1. **Anterior surgery:** The advantage of anterior surgery is that decompression is much better and direct. The main disadvantage is the complications of ant. Surgery is as high as 70%

In our series, 7 patients could walk unaided or with a stick at the endpoint following operation.

Sphincter dysfunction and recovery was seldom reported. In one series of 10 patients with paraplegia, only one of four patients with preoperative bowel and bladder incontinence had recovered functional control [21]. In another series of 13 patients with paraplegia, only one patient with urinary incontinence exhibited improvement in urinary function [18].

Our finding of sphincter function improvement in seven of 15

patients may be due to improved mobility and the treatment of urinary tract infection following surgery rather than an actual improvement in neurological function; this is a limitation of our study.

Our study is limited by its retrospective nature, relatively small group of patients, lack of a control group and

continuous BMD monitoring, and the diversity of surgeons. Further studies using bone mass monitoring, antiosteoporotic treatment, and advances in surgical technology need to be conducted for examining long-term radiological and clinical outcomes.

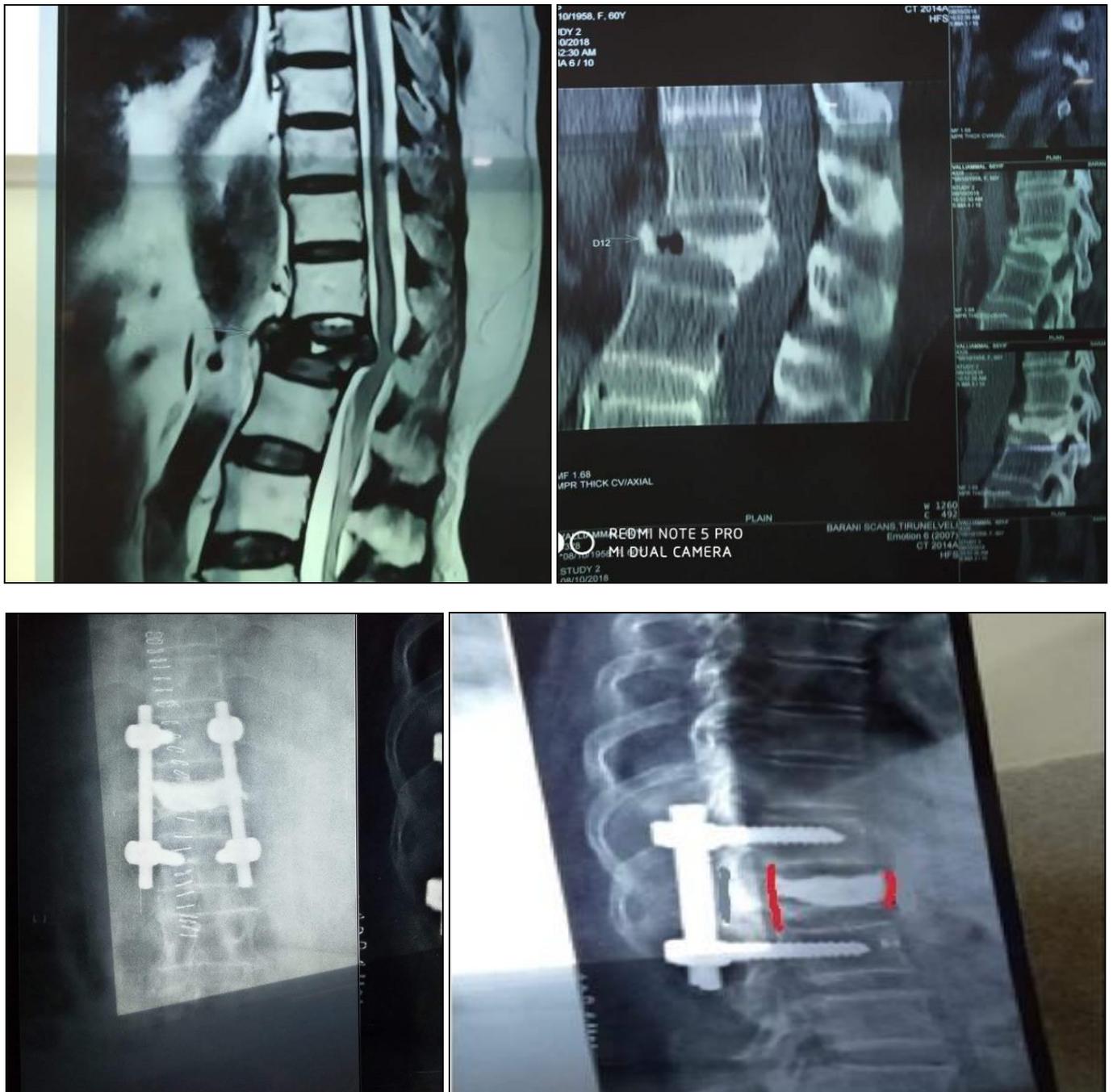


Image 4

Conclusions

Although OVF's are common and generally considered benign, severe and delayed neurological deficits can occur following spinal cord compression. Improved clinical outcomes are associated with compression fractures, less initial retropulsion, lack of surgical complications, and an optimal restoration of retropulsion.

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