

Evaluation of Surgical Management of Spondylolithesis in Osteoporotic patients

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Abstract

Background: Osteoporosis has become a major medical problem as the aged population of the world rapidly grows. Osteoporosis predisposes patients to fracture, progressive spinal deformities, and stenosis, and is subject to be a major concern before performing spine surgery, especially with bone fusions and instrumentation.

Aim of the Work: We aimed to assess different methods of surgical treatment of Spondylolithesis in osteoporotic patients.

Patient and methods: This prospective and retrospective study was conducted on 30 cases with spondylolithesis and osteoporosis at Al-Azhar university hospitals. All patients were operated upon by posterior approach with neural decompression and internal metallic fixation. This study was started at May 2017 and continued for 2 years.

Results: The percentage of improvement of patient complain as regard low back pain: fair (33.3%), good (46.7%), excellent (13.3%), as regard sciatica: fair (6.7%), good (33.3%), excellent (60.0%), as regard claudication: good (50.0%), excellent (50.0%), as regard motor: fair (25.0%), good (25.0%), excellent (50.0%), as regard sensory Good (66.7%), excellent (33.3%), and as regard sphincter: good (50.0%), excellent (50.0%).

Conclusion: In patients with osteoporosis, the DEXA scan is the most effective method to detect these patients. We recommend DEXA scan in all patients above 50 years old specially females. Surgical treatment with transpedicular screw fixation combined with use of bone cement is safe and effective method for treatment of osteoporotic patient with spondylolithesis not responding to medical treatment.

Keywords: Surgical management, spondylolithesis.

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INTRODUCTION

Osteoporosis is a skeletal disorder characterized by compromised bone mass accompanied by micro architectural deterioration of bone tissue predisposing a person to an increased risk of fracture¹

According to the World Health Organization, patients are considered osteoporotic when they have a bone mineral density (BMD) measurement that is 2.5 standard deviations below the typical bone mass of young healthy white woman². Osteoporosis has become one of the most prevalent public-health concerns and a major medical problem, as the age of patients needing spine surgery is increasing steadily as the average lifespan increases³.

Surgical treatment of osteoporosis is still not widely accepted by orthopedic surgeons. Patients with osteoporosis are difficult to treat surgically because of advanced age and associated risks of anesthesia, making them poor candidates for surgery⁴.

However, spinal surgery in elderly patients with osteoporosis has been gaining support. Furthermore, the outcomes of surgical treatment are more favorable than conservative treatment, and patients who undergo spine surgery have a good outcome⁵.

There are different types of spondylolithesis. Degenerative and isthmic types are the most common in old age especially

women, and most usually occurs at the L4-L5 level, it causes back pain and radiculopathy⁶.

There is no universal agreement regarding the optimal surgical approach for the treatment of degenerative spondylolisthesis⁷. This work aimed to assess different methods of surgical treatment of Spondylolithesis in osteoporotic patients.

PATIENT AND METHODS

Prospective and retrospective study on 30 cases with spondylolithesis and osteoporosis at Al-Azhar university hospitals. This study was started at May 2017 and continued for 2 years. The study included all cases of spondylolithesis with osteoporotic vertebrae with failed conservative treatment. While all cases of spondylolithesis with normal bone density or Osteopenia were excluded from the study.

There is a new study that describe a new detailed VAS, which can detect the difference between elderly and young patients with nonspecific low back pain, while the difference couldn't be detected by the traditional VAS and ODI⁸.

Statistical analysis:

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean ± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

RESULTS

The results of the present study are demonstrated in the following tables and figures

Personal history	No.	%
Sex		
Female	26	86.7%
Male	4	13.3%
Age (years)		
Range [Mean±SD]	50-a67 [57.60±4.85]	
Occupation		
Driver	2	6.7%
Housewife	24	80.0%
Worker	4	13.3%
Marital status		
Married	30	100.0%
Special habits		
Negative	28	93.3%
X-heavy smoker	2	6.7%
Comorbidities		
None	10	33.3%
Complications	20	66.7%
DM	16	80.0%
HTN	10	50.0%
IHD	4	20.0%

Table 1: Distribution of cases patients according to their sex, age, occupation, marital status, special habits, comorbidities (n=30). This table shows that the most common are females (86.7%), occupation:housewife (80.0%), married(100.0%), special habits X-heavy smoker (6.7%), as well as complications (66.7%)

Surgical management	No.	%
Transpedicular Fixation after injection of bone cement in the track	18	60.0%
Transpedicular Fixation with canulated screws & bone cement	6	20.0%
Transpedicular Fixation	4	13.3%
Lumber cage	2	6.7%

Table 2: Distribution of patients according to their surgical management (n=30). This table shows that the transpedicular fixation after injection of bone cement in the track (60.0%), transpedicular fixation with canulated screws & bone cement (20.0%), transpedicularfixation(13.3%), and lumber cage (6.7%) of surgical management.



Fig.1A



Fig.1B

Fig.1 A, B: show the steps of using bone cement with ordinary screws as the preformed track by screw is achieved, then bone cement is injected in the track then the screw is re inserted.

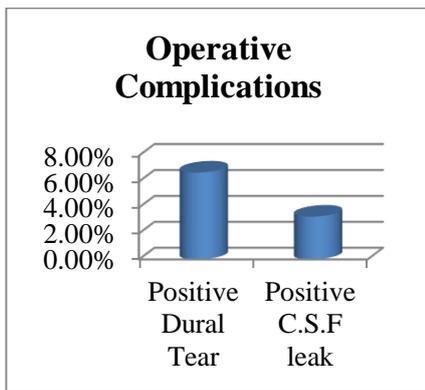


Fig.2 A

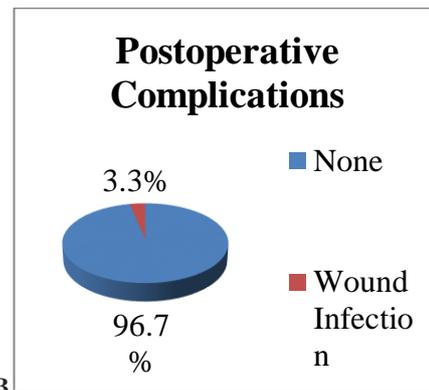


Fig.2 B

Fig.2 A: Operative complications, B: Pie chart postoperative complications distribution of the study group

Outcome	No.	%	x ²	p-value
Low back pain				
No improve	2	6.7%	22.350	<0.001**
Fair	10	33.3%		
Good	14	46.7%		
Excellent	4	13.3%		
Sciatica				
Fair	2	6.7%	45.522	<0.001**
Good	10	33.3%		
Excellent	18	60.0%		
Claudication (n=16)				
Good	8	50.0%	53.792	<0.001**
Excellent	8	50.0%		
Motor (n=8)				
Fair	2	25.0%	32.871	<0.001**
Good	2	25.0%		
Excellent	4	50.0%		
Sensory (n=6)				
Good	4	66.7%	8.333	0.004*
Excellent	2	33.3%		
Sphincter (n=4)				
Good	2	50.0%	4.500	0.034*
Excellent	2	50.0%		

Table 3: shows statistically significant improvement outcome. The percentage of improvement of patient complain as regard low back pain: fair (33.3%), good (46.7%), excellent (13.3%), as regard sciatica: fair (6.7%), good (33.3%), excellent (60.0%), as regard claudication: good (50.0%), excellent (50.0%), as regard motor: fair (25.0%), good (25.0%), excellent (50.0%), as regard sensory Good (66.7%), excellent (33.3%), and as regard sphincter: good (50.0%), excellent (50.0%).

DISCUSSION

Spondylolisthesis is the slippage of one vertebral body in respect to the adjacent vertebral body causing mechanical or radicular symptoms or pain. It can be due to congenital, acquired or idiopathic causes. Spondylolisthesis is graded based on the degree of slippage of one vertebral body on the adjacent vertebral body⁶.

Degenerative spondylolisthesis predominately occurs in adults and is more common in females than males with increased risk

in the obese. Grade I spondylolisthesis accounts for 75% of all cases. Spondylolisthesis most commonly occurs at the L5-S1 level with anterior translation of the L5 vertebral body on the S1 vertebral body. The L4-5 level is the second most common location for Spondylolisthesis.

Symptoms can range in severity from non-existent to a loss of urination and bowel movement control in more severe cases.

In most cases non-surgical treatment is successful in relieving the patient's pain, but if not surgery may be considered²².

In our study medical treatment was tried for at least 1 month in every cases and surgical intervention was done only after failure of medical treatment.

A posterior fusion with pedicle screw instrumentation is generally considered the gold standard form of lumbar spinal fusion²³.

Our study showed different types of posterior fusion.

Okuda et al. examined the surgical outcomes of posterior lumbar interbody fusion in patients who were younger and older than 70 years and found that patients older than 70 years had a higher rate of delayed union than did younger patients, but the overall rate of fusion was not statistically different. Patients who have undergone appropriate screening and workup for osteoporosis and are considering spine surgery should be counseled preoperatively on the risk of delayed fusion. It is also important to note that a direct link between osteoporosis and worse clinical outcomes and a correlation between clinical outcomes and decreased rates of radiographic fusion or loss of deformity correction have not been definitively proven⁹.

In our study all patient have been subjected to DEXA scan to detect osteoporosis in elders specially females.

At the 2000 National Institutes of Health (NIH) Consensus Conference, osteoporosis was defined as a skeletal disorder characterized by compromised bone strength predisposing to an increased risk of fracture¹.

Occurrence and development of osteoporosis is a painless process. The set of degenerative changes appearing in aging spines in symptomatic patients, are identical to those with degenerated spines in asymptomatic subjects⁵.

However, profound inactivity from a progressive and painful degeneration and destabilization of the spine coupled with the pain and inactivity from a symptomatic osteoporotic compression fracture can lead to a downward spiral of further bone loss and degeneration, more vertebral fractures, more pain and inactivity Zygapophysial joint osteoarthritis, degenerative changes in the discs, intervertebral space narrowing, and bony remodeling due to osteoporosis they are all degenerative changes associated with the aging of the spine⁵.

These degenerative changes induce to deformities in the vertebrae, modifications and alterations in the stress distribution and the normal alienation of the spine accountable for the occurrence of degenerative segmental instabilities and subluxations like spinal stenosis, degenerative spondylolisthesis, and scoliosis. Degenerative spondylolisthesis and scoliosis are generally asymptomatic, but they can associate or aggravate a preexisting symptomatic spinal stenosis¹⁰.

In our study patients with back pain and sciatica have been subjected to complete history taking and full general and neurological examination and radiological evaluation to detect bone abnormalities.

The majority of patients with degenerative spondylolisthesis will respond well to non-operative treatment, including NSAIDs, epidural injections, and lumbar flexibility and strengthening exercises. Patients with severe or persistent symptoms that interfere significantly with quality of life, or those with neurological deficit, may benefit from surgical decompression removing all bony and soft-tissue pressure on their neural elements. There is no universal agreement regarding the optimal surgical approach for the treatment of degenerative spondylolisthesis: current controversies include the need for an additional fusion (either posterolateral or interbody fusion) with or without instrumentation, compared with decompression only. In our study posterior decompression was associated with instrumental fixation.

A recent study showed that, in patients with lumbar disk herniation, a delay of ≥ 12 weeks in time to surgery was more likely to result in greater pain at 6 months postoperatively, suggesting that delays in surgical treatment of patients with this and other degenerative lumbar conditions may predispose patients to worse clinical outcomes¹¹.

Therefore, postponing elective spine procedures to allow for medical optimization of osteoporosis is controversial, and no consensus on this topic currently exists. Improvements in BMD occur over relatively longer periods of time and, in many patients, it is not reasonable to consider waiting until evidence of improved BMD has been confirmed on DEXA.

In our study surgical intervention has not been postponed after failure of medical treatment even with poor BMD.

Specific affected levels should be identified and treated, and appropriate sagittal alignment should be restored, although evidence suggests that larger deformity correction in older patients (average age, ≥ 60 years) increases the risk of junctional kyphosis¹³.

In our study the affected level was properly identified and appropriate sagittal alignment was restored.

The trajectory of the sacral screws should ideally be toward the promontory to improve purchase because screws inserted in this tricortical manner have been shown to have twice the insertional torque of bicortical screws¹².

In our study all patient with sacral fixation all trajectories were towards the promontory. Augmentation of pedicle screws with polymethyl methacrylate (PMMA) or calcium phosphate as a method of improving fixation strength has been studied extensively.^{14,15,16,17}

Previous clinical studies have reported peri/postoperative complication incidences when operating on patients with adult spinal deformity and poor bone quality of up to or more than 40%. However, to the present day there are still very few studies evaluating the incidence and specific types of complications associated with its surgical treatment.

In our study operative complications were about 20% and post operative complications were about 20% also.

Amendola et al. published a study of 21 patients who had a poor bone stock condition due to osteoporosis or tumor and who underwent posterior stabilization by fenestrated pedicle screws and PMMA. All patients were clinically and radiographically followed up for a mean of 36 months. No case of loosening was recorded after a mean follow-up of 36 months. augmentation¹⁸. In our study the combination between transpedicular screws and bone cement provided a safe and effective method of fixation. Carreon et al. reported the results of a study examining the rate of perioperative medical complications in 98 elderly patients who underwent posterior decompression and lumbar arthrodesis with instrumentation to treat degenerative disorders of the spine¹⁹.

The mean age was 72 years (65 to 84 years). Perioperative complications occurred in 78 patients (79%). Twenty-one patients (22%) had at least one major complication including 2 deaths both from postoperative wound sepsis, and 69 had at least one minor complication (70%). The most frequent complications were wound infection (10%) among the major complications and urinary tract infection (34%) among the minor complications. A greater blood loss, a prolonged operative time, a greater number of levels fused, and an older age, all were associated with an increased occurrence of perioperative complications. The presence, type, or number of preoperative medical conditions was not related to the occurrence of complications. This finding is similar to that of Benz et al., who reported that the presence of associated medical diseases did not affect the incidence of postoperative complications²⁰.

However, other studies showed that the prevalence of postoperative morbidity increased as the number of pre-morbid diseases increased²¹.

In our study 30 cases of spondylolithesis with osteoporosis were done at al azhar university hospitals over 2 years; the Transpedicular Fixation after injection of bone cement in the track (60.0%), Transpedicular Fixation with cannulated screws & bone cement (20.0%), Transpedicular Fixation (13.3%), and Lumber cage (6.7%) of Surgical management

According to the financial aspects of the patients using ordinary pedicular screws after bone cement injection in the track provided an effective alternative to the cannulated screws with such suitable cost. The results show that the percentage of improvement of patient complain as regard low back pain: fair (33.3%),good (46.7%),excellent (13.3%), as regard sciatica: fair (6.7%),good (33.3%),excellent(60.0% , as regard claudication: good (50.0%), excellent (50.0%), as regard motor: fair (25.0%), good (25.0%) , excellent (50.0%) , as regard sensory Good (66.7%), excellent (33.3%),and as regard sphincter : good (50.0%),excellent (50.0%) .

CONCLUSION

In patients with osteoporosis,the DEXA scan is the most effective method to detect these patients .We recommend DEXA scan in all patients above 50 years old specially females .Surgical treatment with transpedicular screw fixation combined with use of bone cement is safe and effective method for treatment of osteoporotic patient with spondylolithesis not responding to medical treatment .

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