Comparative Study Between Bony Fusion Either Central Or Lateral Only And In Association With Transpedicular Screw Fixation In Management Of Lumbar Spondylodiscitis.

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Abstract: Objective: The present work was designed to compare between bony fusion either central or lateral only and in association with transpedicular screw fixation in management of spondylodiscitis. **Background**: Spinal infections are an uncommon but important clinical problem that often requires aggressive medical therapy, and sometimes even surgery. Several terms can be found in the scientific literature describing infection of the spine, namely discitis, spondylodiscitis, spondylitis, vertebral pyogenic osteomyelitis, and pyogenic spinal infection, creating confusion in the literature nomenclature. Current data show that in most cases, the infection involves both the disc space (discitis) and the adjacent vertebral body, suggesting that these radiological findings represent the different stages of the same disease. Therefore, spinal infections are now more correctly considered as a spectrum of diseases that include spondylitis, discitis. **Materials and methods:** This is a prospective non controlled non randomized study which included 40 patients with lumbar or lumbosacral spondylodiscitis who were treated between August 2015 and February 2017 and were followed up until July 2017. The study included 31 male (77.5%) and 9 female (22.5%), male: female ratio 3.4:1 and the mean age was 50 ± 4 years, ranging from 22 to 62 years. Among the 40 surgically-treated patients, 20 patients were managed by posterior surgical approach for bony fusion either central (14) or lateral (6) only and 20 patients were managed by posterior surgical approach for bony fusion in association with transpedicular screw-rod fixation. **Results:** In comparing the instrumentation and non instrumentation group regarding safety and effectiveness parameters; there was significant difference (p-value <0.01) between the instrumentation and non instrumentation group in the mean values of CRP in the end of follow up period with 3.8 ±.8 for the instrumentation and 4.8 ±.4 for the non instrumentation group, also all frankle scale showed significant difference (p- value <0.01) in favor of the instrumentation group. The hospital stay was shorter in the instrumentation group with a mean of 10.5 ± 3.7 days and 21.7 ± 16.0 for the non instrumentation (p<0.05). There was no significant difference between patient with previous spinal surgery as a risk factor and patient with systemic illness regarding safety and effectiveness parameters. There was significant difference (p <0.05) between instrumentation and non instrumentation group in patient with Refractoriness to medication/severe pain as an indication for surgery in the mean days of hospital stay, with a mean of 9.4 ± 2.4 days for the instrumentation group and 16.0 ± 11.3 days for the non instrumentation group. In comparing different surgical approaches regarding safety and effectiveness parameters; there was significant difference (p- value <0.05) between the central or lateral bony fusion only group and the other (central or lateral bony fusion in association with transpedicular screws) group in the means of blood loss and operative time, but there was no significant difference regarding the complications and VAS, Barthel index, Frankel scale in the follow up periods. **Conclusion:** The majority of early stage spondylodiscitis responds well to conservative treatment. Surgical intervention Success was obtained in both groups especially The excellent results were with instrumentation group. instrumentation can relieve pain, improve sagittal balance and neurologic function, and finally result in early ambulation,. If the debridement of infected tissue is complete, instrumentation shows neither persistence nor recurrence of secondary infection and does not prolong the usage of antibiotics and hospitalization.

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Key Words: spondylodiscitis, lumbar spine.

1. Introduction:

Spinal infections are an uncommon but important clinical problem that often requires aggressive medical therapy, and sometimes even surgery. Several terms can be found in the scientific literature describing infection of the spine, namely discitis, spondylodiscitis, spondylitis, vertebral pyogenic osteomyelitis, and pyogenic spinal infection, creating confusion in the literature nomenclature. Current data show that in most cases, the infection

involves both the disc space (discitis) and the adjacent vertebral body, suggesting that these radiological findings represent the different stages of the same disease. Therefore, spinal infections are now more correctly considered as a spectrum of diseases that include spondylitis, discitis, spondylodiscitis, and epidural abscess, and will be generically referred to as spondylodiscitis (SD) ***(Cramer et al., 2013).***

There are three main contamination routes: hematogenous spread, external inoculation or involvement from adjacent tissue. Clinical presentation can be quite varied, making diagnosis not always obvious. Local pain in the posterior aspect of the neck or back in a febrile patient should always be investigated for spondylodiscitis. Pain is characteristically mechanical: increased with standing position and relieved by recumbency; it typically gets worse with time and at later stages can even be at rest. Pain can be associated with neurological symptoms secondary to either direct compression by suppurative material or as the result of the posterior dislocation of a bony fragment into the spinal canal that compresses the spinal cord and/or the nerve roots. Known risk factors for SD are advanced age, diabetes mellitus, rheumatoid arthritis, immunosuppression, alcoholism, long-term steroid use, concomitant infections, poly-trauma, malignant tumor, and previous surgery or invasive procedures (discography, chemonucleolysis, and surgical procedures involving or adjacent to the intervertebral disc space ***(Ozalay et al., 2015).***

The incidence of acute pyogenic SD is estimated to be 5–5.3 per million patients per year with a male predominance; however, some studies suggest that this incidence is rising, possibly due to an increase in the rate of nosocomial infections associated with vascular devices and other forms of instrumentation and to an increasing prevalence of intravenous drug abusers. In a recent study, the incidence of hospital-acquired SD (following invasive procedures or not) accounted for more than 50% of cases. Males are more commonly affected than females in the ratio of 2:1, for unknown reasons. The average age at clinical presentation is the fourth to fifth decade. The most common level of involvement is at the lumbar spine, followed by the thoracic, cervical and sacral levels: lesions at the thoracic spine tend to lead more frequently to neurological symptoms. The aim of the current paper is to describe current evidence-based standards of therapy in management of SD by emphasizing pharmacological therapy and principles and indications for bracing and surgery (***Lim et al., 2008).***

2. Methods:

This is a prospective non controlled non randomized study which included 40 patients with lumbar or lumbosacral spondylodiscitis who were treated between August 2015 and February 2017 and were followed up until July 2017. The study included 31 male (77.5%) and 9 female (22.5%), male: female ratio 3.4:1 and the mean age was 50 ± 4 years, ranging from 22 to 62 years.

Among the 40 surgically-treated patients, 20 patients were managed by posterior surgical approach for bony fusion either central (14) or lateral (6) only and 20 patients were managed by posterior surgical approach for bony fusion in association with transpedicular screw-rod fixation.

Inclusion criteria:

Patients who had been diagnosed as lumbar or lumbosacral spondylodiscitis and have one or more of the following pathological changes.

- Refractoriness to medical management after at least 2-3 weeks (persistent elevation ESR & CRP).
- significant neurological deficit, the presence of epidural abscess, spinal deformity.
- instability, Severe destruction of endplates, Septic pseudarthrosis.
- Severe Persistent pain, septicemia despite antibiotic treatment.
- Systemic effects of chronic infection such as malnutrition and cachexia and unsure diagnosis.

Exclusion criteria:

Patients showed improvement on medical treatment (clinically and laboratory), multiple distant level involvement evidenced by MRI, or patients unfit for surgery.

All patients were subjected to the following:

1) Complete History talking:

❖ Personal (age, sex, occupation, residence, marital status and habits).

❖ Complaint (the patient's own words).

❖ Present history (Onset, course and duration of the complaints are assessed (parasthesia, weakness, wasting, deformity sphincter disturbance, sexual disorders), then any relieving or exaggerating factors, response to any previous lines of treatment.).

❖ Past history The patient is asked for any past history of diseases, drug, operation, or any invasive procedure such as lumbar puncture.

❖ In all patients Visual pain analogue scale (VAS) was used to assess the severity of pain. If a zero means "no pain" and a ten (10) means pain as bad as it could be, on this scale of 0 to 10 the patient was asked to put x through the number corresponding to severity to his pain.

❖ The activity of daily living was assessed by barthel index. The original Barthel Index was developed in the USA by Florence Mahoney and Dorothea Barthel (1965). Barthel Index was developed to measure activities of daily living. The 10 subtest items include (1) feeding, (2) moving from

wheelchair to bed and return, (3) personal grooming, (4) getting on/off the toilet, (5) bathing, (6) walking or propelling a wheelchair, (7) stair climbing, (8) dressing and undressing, (9) bowel and (10) bladder continence. Each subtest item on the original Barthel Index is rated 0, 5 or 10 (or 15 for two of the test items). Maximum total score is 100. A total score of 100 represents the highest level of independence although a perfect score does not necessarily mean that a person is able to perform instrumental activities of daily living.

❖ The central or lateral bony fusion status and sagittal alignment of the infected segments were assessed using radiographic studies.

❖ 2) Complete examination:

❖ General (weight, height, vital signs, head, chest, heart abdomen and pelvis).

❖ examination of the back:

a) Inspection of the back for deformity.

b) Palpation of the spine for local tenderness.

c) Evaluation of range of movement and muscle spasm.

❖ Neurological evaluation:

a- Sensory examination:

- Superficial sensation including: Pain, Touch, and Temperature.

- Deep sensation: Joint sensation, Sense of joint motion, sense of position and deep pressure sense.

b- Motor examination for Muscle state, tone, power and deep tendon reflexes.

c- Frankel scale was used to categorize the neuro-logical deficit preoperative as follows;

➢ *Frankel-A:* patient has no motor or sensory function below the spinal cord injury level (complete)

➢ *Frankel-B:* patient has no motor function below the injury level (incomplete)

➢ *Frankel-C:* patient has motor and sensory function below the level of injury but the motor function was useless.

➢ *Frankel-D:* patient has motor useful, but not normal function below the level of spinal cord injury.

➢ *Frankel -E:* patient has no motor, sensory or sphincter disturbance.

3) Investigations (pretreatment):

- Routine laboratory investigations; (CBC, liver function tests, kidney function tests, coagulation profile, random blood glucose level, chest x- ray and ECG).
- Blood grouping, cross matching.
- Special interest should be given to analysis of the laboratory values of CRP, ESR and WBC count. An elevated value of ESR and CRP were considered to be common laboratory abnormality. Of these, CRP level was a more valuable serum marker during follow-up study because of its temporal pattern in the blood stream and comparatively quicker normalization with effective treatment. Postoperative spondylodiscitis was suspected when the mean CRP level had not returned to a value below 50% of the peak value on the second Postoperative day, or when these markers fail to show a decline from preoperative values with aggravated clinical symptoms and signs such as fever, intractable pain, or neurological deficit.
- Neuroimaging studies (plain X-ray- CT-MRI); MRI (with contrast) was the gold standard in the diagnosis and help to suspect the causative organism and to identify the complication as epidural abscess.

4) Surgical techniques:

❖ Surgical debridement, complete removal of the infected, necrotic tissue was attempted with extensive irrigation with antibiotic solution; decompression only, and decompression associated with instrumentation were done to all patients according to the pathology and availability of certain implants.

❖ Different approaches and different instrumentation was used including:

a. Posterior decompression and central or lateral bony fusion only. Transpedicular screws fixation.

b. Combined Posterior decompression with posterior Transpedicular screws fixation.

c. Transformational Lumbar Interbody Fusion (TLIF) and Posterior Instrumentation.

❖ In order to gain more accurate results, Biopsy material has undergone aerobic, anaerobic, fungal, mycobacterial cultures and stained with gram stain, Ziehl-Neelsen and special stain for fungi.

❖ During each procedure the following points had been reported:

a. Operative duration

b. Operative complication

c. Blood loss: by calculating the blood in the container of suction in every case.

d. Postoperative complication

e. Postoperative ambulation period

f. Postoperative hospital stay

g. Difficulties encountered

❖ Postoperative antibiotic was given according to cultures results and the duration was monitored by laboratory markers.

5) Postoperative Follow up:

All patients were followed up monthly for the first 3months post-operative then every two months until the end of this study through:

a. Clinical follow up: the clinical outcome was assessed according to Barthel Index which has been used since 1960s because of its high reliability and validity, as regarding activity of daily living (ADL). Visual pain analogue scale (VAS) was used to assess the severity of pain. The postoperative results were

compared with the preoperative to identify the clinical outcome.

b. Laboratory markers (WBC count, CRP and ESR).

c. Radiological follow up: In all patients, X-rays of the affected spine A-P and lateral views was done within 3 days post-operatively, and then with each follow up for assessment of subsidence of infection, implants related complications, changes in the sagittal alignment and bony fusion. CT was done in cases that needed more evaluation.

The (t) test is used to asses the statistical significance of difference between two means. By knowing the (t) test and the degree of freedom, the (P) value is calculated from special tables, and so, the significance of the results was determined from the "t" distribution tables.

P <0.05 = insignificant difference, P >0.05 = significant difference.

P > 0.01 = highly significant difference, P > 0.001 = very highly significant difference.

3. Results:

In this study we found that:

The study included 31 male (77.5%) and 9 female (22.5%), male: female ratio 3.4:1 and the mean age was 50 ± 4 years, ranging from 22 to 62 years.

In the studied series, risk factors were identified in 36 patients (90%). Many patients with spondylodiscitis had previous spinal procedures (20 cases) including lumbar spine surgery (19 cases) and lumbar puncture in one case of suspected meningitis, diabetes mellitus (6 cases), chronic liver disease (3 cases), and chronic renal disease (1 case) was diagnosed preoperatively, systemic infections (3 cases) such as pneumonia (1 case), meningitis (1 case), acute pyelo-nephritis (1 cases), other predisposing factors, such as smoking (1 case), intravenous drug abuse (1 case) and one female on chronic steroid for systemic lupus erythromatosis.

The duration of symptoms before diagnosis ranged from 2 to 24 weeks with the mean duration 11.60 ± 6.64 weeks. The clinical presentations varied between the studied patients; the classical presentation of spondylodiscitis (persistent back pain, local tenderness, limited movement, paravertebral muscle spasm) was present in most cases (36 cases) fever was present in 11 cases, radiculopathy in 20 cases, neurological deficit in 6 cases, Constitutional symptoms in 5 cases and chills/rigors in 4 cases

The lumbar spine was the most common site of spondylodiscitis (32 cases), followed by the lumbosacral spines spine (8 cases). The number of infected vertebral bodies varied from one to three; one infection sites in four patients, two levels of vertebral body infection were identified in thirty-three patients, followed by three infection sites in three patients

Figure 1 illustrates Comparison between different sources of infection regarding safety and effectiveness parameters.

there was significant difference (p-value <0.05) between the instrumentation and non instrumentation group in the mean values of CRP in the end of follow up period with 3.61 ± 1 for instrumentation and 4.2 ± 1 for non instrumentation group.

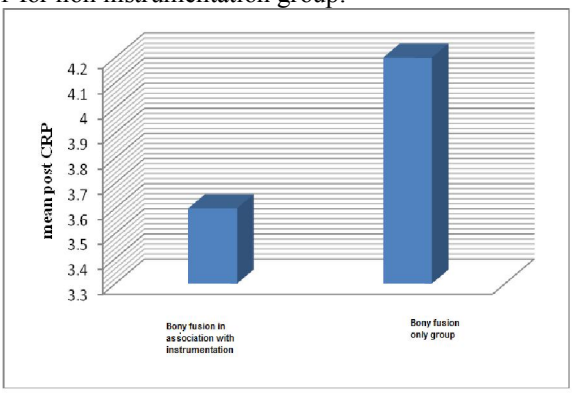

Figure 1: comparison between the instrumentation and non instrumentation group in the mean values of CRP in the end of follow up period.

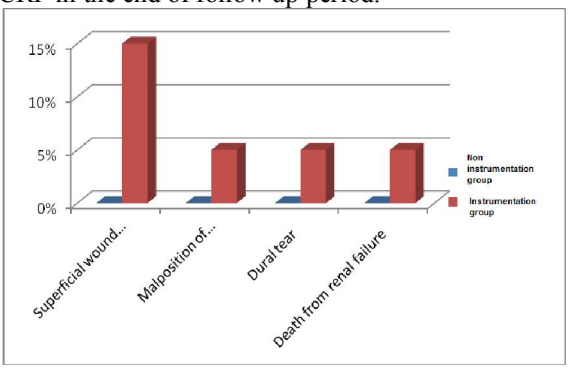

Figure 2: comparison between the instrumentation and non instrumentation group as regard complications.

Figure 2 illustrate Comparison between the instrumentation and non instrumentation group as regard complications, all the complication occurred in the instrumentation group (p <0.001).

Figure 3 illustrate Comparison between the instrumentation and non instrumentation group regarding The hospital stay; The hospital stay was shorter in the instrumentation group with a mean of 10.5 ± 3.7 days and 21.7 ± 16.0 for the non instrumentation (p<0.05).

Figure 4 illustrate Comparison between instrumentation and non instrumentation group in patient with Refractoriness to medication/severe pain as an indication for surgery in the mean days of

hospital stay, with a mean of 9.4 ± 2.4 days for the instrumentation group and 16.0 ± 11.3 days for the non instrumentation group.

Figure 5 illustrate Comparison between the central or lateral bony fusion only group and the central or lateral bony fusion in association with transpedicular screws group in the means of blood loss and operative time, there was significant difference (p- value <0.05).

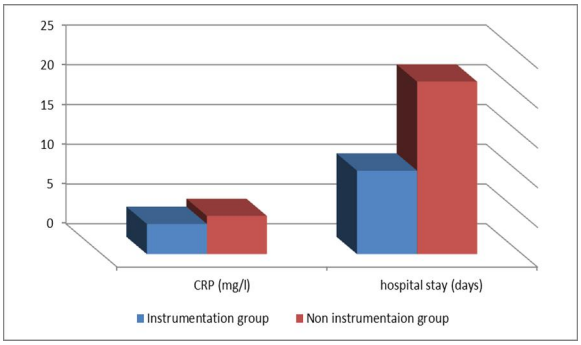

Figure 3: comparison between the instrumentation and non instrumentation group in the mean values hospital stay & CRP in the end of follow up period.

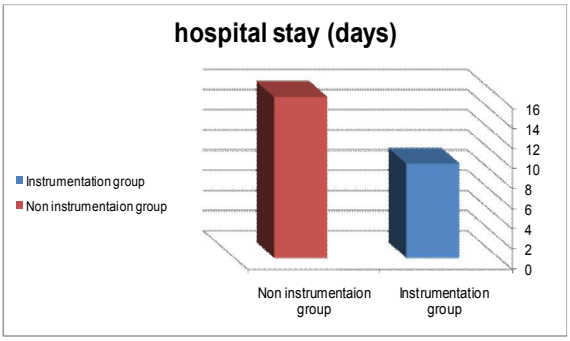

Figure 4: comparison between instrumentation and non instrumentation group regarding Refractoriness to medication/severe pain as an indication for surgery in the mean days of hospital stay.

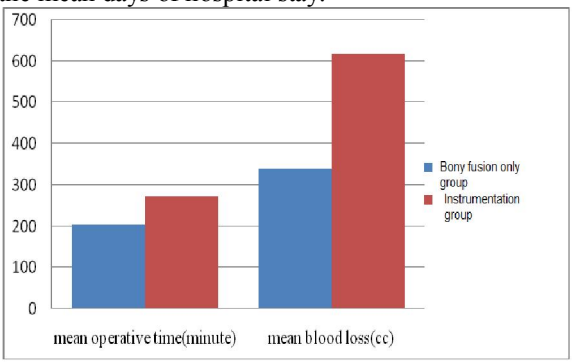

Figure 5: comparison between the central or lateral bony fusion only group and the central or lateral bony fusion in association with transpedicular screws group in the means of blood loss and operative time.

4. Discussion:

The present work aimed to study the comparison between bony fusions either central or lateral only and in association with transpedicular screw fixation in management of spondylodiscitis.

Many authors have discussed the spondylodiscitis, methods of management and factors affecting the results.

In the pre-1990 period, implants were seldom used in the management of pyogenic spinal infections. A number of reports had implicated that radical debridement and autogenous strut-graft fusion combined with antibiotics coverage without instrumentation was the most commonly adopted therapy. Even the importance of immobilization for the suppression of infection have been emphasized by several researchers, but it was not until the 1990s of the last century, internal fixation started gaining some acceptance in reconstructive surgery performed in the setting of active infection ***(Fukuta et al.,2003).***

Several authors have suggested bed rest and prolonged external bracing rather than placing spinal instrumentation ***(Asamoto et al., 2005).*** Others have advocated a staged instrumented operation with a period of antibiotics therapy after debridement only surgery ***(Ozalay et al., 2010).*** The complications after surgical treatment without instrumentation are loss of correction, listhesis, pseudarthrosis, and spinal stenosis, Although the use of both allograft and autografts has been accepted as safe, demonstrations of the effectiveness of instrumentation have been speculative, based on several retrospective reviews ***(Heo et al., 2011).***

Some authors see that autologous bone grafts have limitations in cases with extensive bone loss and may result in donor site morbidity. In addition, autologous bone grafts are of insufficient length when we perform multilevel corpectomy. Allofibular bone grafts have insufficient contact surface between the vertebral bodies and graft ***(Heo et al., 2011).***

The use of instrumentation has many advantages as it provides alterability of length, sufficient contact surface, confers better sagittal balance, provides little loss of correction, lack of donor site morbidity and allows high fusion rates compared with non-instrumented cases. Instrumentation may also decrease the need for prolonged external immobilization ***(Lim et al., 2008).***

Some authors see that Recurrence of infection in the presence of instrumentation is similar to that in its absence, indicating that infection may not be a contraindication for its use ***(Lim et al., 2008).*** We think the culprit for the recurrence of infection is not the implants itself, but is the compromised general health condition of the patients.

In vertebral osteomyelitis predominantly

involves the vascular vertebral body, with involvement of the posterior elements in only 5% of the cases. This explains why anterior debridement has become the gold standard for a better infection control ***(Ozalay et al., 2010).***

It is preferred as it allows improved visualization of the part of the spine most commonly affected. In an anterior epidural abscess, which is frequently associated with vertebral osteomyelitis, anterior decompression followed by bone grafting and instrumentation when necessary is essential ***(Przybylski and Sharan, 2001).***

So in this study, the main goal was to build up our own experience in the role of spinal instrumentation in the surgical management of spondylodiscitis.

Our study included 40 patients with spondylodiscitis underwent surgical management with and without spinal instrumentation. In this chapter, our experience will be reviewed, discussed and compared with other studies.

In our study, the number of male patients was 31cases (77.5%), and the number of female patients was 9 cases (22.5%). male: female ratio 3.4:1.

In ***(Lim et al., 2008),*** a series of 28 patients, the number of male patients were 21(75%) and the number of female patients was 7 cases (25%) with a male to female ratio of 3:1.

In the study conducted by ***Ozalay et al., (2010),*** 16 patients; 9 males (56.25%), and 7 females (43.75%) were included with a male to female ratio 1.2:1.

In the study conducted by ***Pee et al., (2008),*** a study of 60 patients, 36 were Men (60%) and 24 were women (40%). The male to female ratio was 1.5:1.

This means that our study correlates with other studies in the Predilection of spondylodiscitis for male population.

In contrast to the study conducted by ***Lee et al., (2004),*** a series of 30 patients, 17 were women (56.7%) and 13 were men (43.3%), with slight female predominance with female to male ratio of 1.3:1.

Recently, ***Heo et al., 2011,*** reported a study included 19 patients, 9 men (47%) and 10 women (53%), there was also very slight female predominance with female to male ratio of 1.1:1.

Age of patients in our study ranged from 22 to 62 years with a mean age of 50 years which is very close to the mean age of 51 years reported by ***Lim et al., (2008),*** but lower than the mean age of 58 years reported by ***Pee et al., (2008),*** the mean age of 56.8 years reported by ***Lee et al., (2004),*** the mean age of 66 years reported by ***Ozalay et al., (2010),*** and the mean age of 55.7 years reported by ***Heo et al., (2011).***

In our study, the peak incidence of spondylodiscitis in our patients was in the fifth decade of life (33.3%), which agreed with that reported by ***Lee et al., (2004),*** with incidence of 30%. But in the series reported by ***Pee et al., (2008), Ozalay et al., (2010), and Heo et al., (2011),*** the peak incidence was in the sixth decade of life with an incidence of 35%, 31.25%, and 42% respectively.

In our study, risk factors were identified in 90% of cases which is higher than other studies. The most common Predisposing factors for spondylodiscitis was previous Spinal surgery / lumbar puncture 20 (50%) followed by Diabetes mellitus 6 (15.0%), Systemic infection 7.5%, Liver disease 7.5%, chronic renal disease (2.5%), other predisposing factors, such as smoking (1 case), intravenous drug abuse (1 case) and one female (2.5%) on chronic steroid for systemic lupus erythromatosis.

In the study conducted by ***Lee et al., (2004),*** risk factors were identified in 77% of cases, with multiple risk factors found in 53% of patients (mean of three risk factors per patient). Primary risk factors included diabetes mellitus (44%); extra spinal infection, especially urinary tract infections (33%); long term steroid drug use (24%); malignancy (17%); and alcoholism (11%). Additional risk factors were acquired immunodeficiency syndrome infection and chemotherapy treatment.

The study conducted by ***Lim et al., (2008)*** correlated with us and also with that of **Lee et al., (2004)** regarding the Risk factors as postoperative spondylodiscitis and diabetes mellitus were the most common Predisposing factors for spondylodiscitis equally, postoperative spondylodiscitis was present in 6 cases of 28 cases (21%), Diabetes mellitus in 6 cases (21%), systemic disease in 13 (46%), chronic liver disease in 4 patients (14%), and 3 patients (10.7%) with pulmonary tuberculosis.

In the study conducted by ***Pee et al., (2008),*** postoperative spondylodiscitis was diagnosed in 36 patients (60%). Five patients had undergone invasive procedures such as root block or discography before they experienced infection. Three patients had urinary tract infections, 1 of which was diagnosed as an acute hematogenous infection of the spine. One patient had a recent history of cholecystectomy at another hospital, and a blood culture obtained postoperatively at that hospital revealed infection. The source of infection could not be identified in the remaining 17 patients.

In the study conducted by ***Ozalay et al., (2010),*** Medical co-morbidities were present in all patients except two: diabetes mellitus was the most common Predisposing factors for spondylodiscitis presenting in (56.25%) of patients.

In the study conducted by ***Heo et al., (2011),*** diabetes mellitus was also the most common Predisposing factors for spondylodiscitis presenting in

8 patients (56.25%) of patients followed by systemic infections (7 cases), such as pneumonia (1 case), meningitis (1 case), acute pyelonephritis (2 cases), chronic osteomyelitis of another site (2 cases), and septic thrombophlebitis (1 case). Other general conditions, such as end-stage renal disease (3 cases) and adrenal insufficiency (1 case), were diagnosed preoperatively.

The diagnosis of spondylodiscitis in our study and all previous studies was based on clinical presentation; imaging findings, including findings on plain X-ray, computed tomography, and magnetic resonance imaging; and hematologic examinations, including white blood cell count analysis, C-reactive protein (CRP), and erythrocyte sedimentation rate (ESR).

The duration of symptoms before diagnosis ranged from 2 to 24 weeks with the mean duration 11.60 ± 6.64 weeks which is correlated with that reported by most authors ***(Cone et al., 2008).***

This delay in the diagnosis occurred because the onset of symptoms is insidious, can be sometimes not specific, vague or almost absent, and often underestimated by the patients, the rarity of the disease and the high frequency of low back pain in the general population; all these may contribute to delayed diagnosis and give a chance for complications to occur, the same rationale mentioned by most authors. ***(Müller et al., 2004 & Mariconda et al., 2007)***

The diagnostic delay in pyogenic spondylodiscitis, (especially staph. aurous) was significantly shorter (2-12weeks), which may reflect the higher clinical expression of this group of patients than TB or brucella**,** the same finding was noticed in the study of ***Ozalay et al., (2010).***

The most common clinical presentations of spondylodiscitis in our study was persistent back pain, and the most common clinical signs were local tenderness, limited movement, and paravertebral muscle spasm, presented in most cases 90% (36 cases). Fever was present in 11 cases (27.5%), radiculopathy in 20 cases (50%), neurological deficit in 6 cases (15%), five from them (83.3%) was T.B. Constitutional symptoms in 5 cases (16.66%), chills/rigors in 4 cases (10%), and deformity in 1 cases (2.5%).

Lee et al., (2004), agreed with us that the most common clinical presentation was axial spine pain presented in (95%). Radicular pain ranged from 20 to 65% of cases, 15% present with neurological deficits, which is slightly lower than that in our study.

Of great value to our practice is the predominance of neurological deficit in patients with tuberculous spondylodiscitis, the same finding reported in the study of ***Lee et al., (2004),*** in which 75% of neurological deficits were present in tuberculous spondylodiscitis.

Ozalay et al., (2010), mentioned that all his patients (16 cases) had fever and pain on palpation. Neurological deficit was present in 7 patients (43.7%), which is higher than that in our study.

Preoperative ESR & CRP was elevated in all our cases, a similar finding in the study of ***Ozalay et al., (2010),*** but the WBCs in our cases was the least useful amongst the inflammatory markers; it was elevated in only 6 cases (15%) which are much lower than the 81.2% presented in the studied series of ***Ozalay et al., (2010).***

Lim et al., (2008), also mentioned that elevated ESR & CRP values was a common laboratory abnormality but did not specify the percentage. Our analysis of patient's data in the study of ***Heo et al., (2011),*** revealed that ESR & CRP was elevated in 89% of patients.

The degree of elevation of (ESR) in our series has shown no relation to the severity of the infection as described by imaging or patient age but it was used as a marker for the response to treatment.

In the series of most authors as well as ours, the CRP value was the preferred marker for monitoring response to treatment as it has short half life and rapidly normalized ***(Zarrouk et al., 2013).***

MRI was the diagnostic tool of choice in our and all previous studied. In the study conducted by ***Ozalay et al., (2010),*** the bone scans were also used to rule out multi-focal involvement.

The lumbar spine was the most common site of spondylodiscitis 32 cases (80%), followed by the lumbosacral spines 8 cases (20%).

The study conducted by ***Lim et al., (2008),*** agreed with us as the most common location in that study was lumbar spine (54%), and followed by the thoracic spine (32%) and cervical spine (14%). Also, in the study conducted by ***Ozalay et al., (2010),*** the lumbar spine was the mostly affected level (8 patients) from a series of 16 patients, followed by the thoracic spine (6 patients), and the thoracolumbar junction in 2 patients.

In the study conducted by ***Heo et al., (2011),*** the lumbar spine was also the most common site of spondylodiscitis (13 cases) in a series of 19 patients, followed by the thoracic spine (3 cases). There were two cases that involved the thoracolumbar spine and one case that involved the cervical spine.

In the study conducted by ***Pee et al., (2008)*** Fifty-nine of the patients (from 60 patients) had lumbar lesions, and 1 had a thoracolumbar lesion. That means that our study correlates with most reported studies in the most affected level of spondylodiscitis.

The common localization of spondylodiscitis was different from ours and other series in the study conducted by ***lee et al., (2004),*** as it was predominantly in the thoracic (52%) and lumbar (43%) spine, and cervical (23.3%).

The number of infected vertebral bodies varied from one to three; one infection sites in four patients, two levels of vertebral body infection was identified in thirty-thee patient, followed by three infection sites in one patient.

In the study conducted by ***Heo et al., (2011),*** the number of infected vertebral bodies varied from one to four. Two levels of vertebral body infection were identified in 13 patients from total number of 19 patients, followed by three infection sites in three patients, four infection site in two patients, and one infection sites in one patient.

In the series of ***Ozalay et al., (2010),*** all infections were monofocal, except one case which was bifocal.

Biopsy for Cultures was obtained intraoperatively in all our cases, the same occurred in the operated series of ***Lee et al., (2004), Lim et al., (2008), Ozalay et al., (2010), and Heo et al., (2011).***

In the study conducted by ***Pee et al., (2008),*** in 23 of the 60 patients, a preoperative biopsy sample and culture were obtained (from a CT-guided aspiration in 12 patients, from a percutaneous endoscopic discectomy after administration of a local anesthetic with irrigation in 6 patients, and from the previous surgical wound in 5 patients). In the remaining 37 patients, intraoperative specimens were obtained.

As regarding the isolated organisms in our study there were no bacterial isolates in 5 patients (12.5%) which is almost the same as the (16.2%) reported by ***Pee et al., (2008),*** but lower than 21% reported by ***Heo et al., (2011),*** 25% reported by ***Ozalay et al., (2010),*** and (43%) reported by ***Lim et al., (2008).***

Staphylococcus aurous was the most common strain isolated in our series (45%), followed by mycobacterium tuberculosis (15.0%), and with nearly similar results in the study conducted by ***Lim et al., (2008),*** in which the most common identified organism was staphylococcus species (25%), followed by Mycobacterium tuberculosis (18%). In the study conducted by ***Heo et al.,*** Among the 15 patients with culture data, Staphylococcus aurous was also the most common strain (7 cases), but followed by Klebsiela pneumonia (3 cases).

In our study brucella was isolated in (10%), the third common organism, this result is totally different from that reported by ***Ozalay et al., (2010)***, in which brucella was the most common isolated organism (31.25%) and staph. Aurous was the third common isolated organism (18.75%), this may be due to regional variation or geographic distribution of the studied series.

In the study conducted by ***Pee et al., 2008,*** the most common causative organism was Staphylococcus epidermidis, which was positive in 14 patients (45%); this was because postoperative infection was diagnosed in 36 patients. Five patients had undergone invasive procedures such as root block or discography before they experienced infection, followed by Staphylococcus aurous (14%) and Pseudomonas species (14%).

Other organisms such as, Streptococci cases (5%) and Coagulase -ve staph (5%) were also isolated. Escherichia coli, (3.3%) and Pseudomonas and pneumococci were also isolated each in a single case. These organisms were also isolated in the other series with multiple variations.

Notably, in our and in the previously mentioned series, no cases of fungal spondylodiscitis were reported except one case in the studied group of ***Lee et al., (2004).***

There was no mention of isolation of polymicrobial organisms in any case of the studied series of ***Lee et al., (2004), Pee et al., (2008), Lim et al., (2008), Ozalay et al., (2010),*** and ***Heo et al., (2011),*** which is a similar finding in our study.

The source of organism was iatrogenic in 20cases (50%) from the studied group as it occurs after spinal surgery or lumbar puncture, while in the remaining 20 cases; the source of the organism was the blood (50%).

In comparing our results with other studies, postoperative spondylodiscitis was present in 6 cases of 28 cases (21%), in the study of ***Lim et al., (2008),*** which is lower than our cases, and was diagnosed in 36 patients (60%), in the study conducted by ***Pee et al., (2008),*** which is much higher than our cases.

Our inclusion criteria were based on the present pathology, the clinical picture and response to previous medication patients who had been diagnosed as spondylodiscitis and have one or more of the following pathological changes: refractoriness to medical management was the most common indication (47.5%) after at least 2-3 weeks (persistent elevation of laboratory markers), followed by abscess formation (15%), severe persistent pain (12.5%), neurological deficit (10%), multiple indications (10%) such as endplate destruction, spinal deformity, severe pain, neurological deficits and unsure diagnosis.

In the study conducted by ***Pee et al., (2008),*** indications for treatment in this series of patients were mostly pain, failure of conservative treatment, destruction of vertebrae, and severe abscess formation. Fifty-eight patients from sixty (96.7%) complained of severe back pain (preoperative VAS score > 5, 34 of them had a preoperative VAS score of

9 or 10, this higher difference because pain is a subjective variable. Twenty five patients (41.7%) exhibited vertebral body destruction including the anterior or posterior cortical margin. Sixteen patients (26.7%) had neurological compromise as noted by lower-extremity weakness or sensory change.

Our inclusion criteria are matching those reported by ***Lee et al., (2004), Pee et al., (2008), Lim et al., (2008), Ozalay et al., (2010), and Heo et al., (2011).***

Our exclusion criteria were; Patients showed improvement on medical treatment (clinically and laboratory), multiple distant level involvement evidenced by preoperative imaging, or patients unfit for surgery. Our exclusion criteria definitely matches all the reported series studied by *Lee et al., (2004),* ***Pee et al., (2008), Lim et al., (2008). Ozalay et al., (2010)****, and* ***Heo et al., (2011),*** but with some differences as the following; In the study conducted by ***Lee et al., (2004),*** Iatrogenically acquired infections were excluded, In the study conducted by ***Pee et al., (2008),*** granulomatous spondylodiscitis was excluded.

In the study conducted by ***Ozalay et al., (2010)***; the exclusion criteria were: post-surgery spondylodiscitis, or staged surgery, and tuberculous spondylodiscitis.

Among the 40 surgically-treated patients, 20 patients were managed by posterior surgical approach for bony fusion either central 14 patients (35 %) or lateral only 6 patients (15 %) and 20 patients were managed by posterior surgical approach for bony fusion in association with transpedicular screw-rod fixation.

Transpedicular screws + lumbar cage in 12 patients (30%), transpedicular screws + bone graft in the eight patients (20%).

In the study conducted by ***Lim et al., (2008)***, anterior interbody fusion with anterior instrumentation was performed in 13 patients (46%). Anterior interbody fusion with posterior Instrumentation was performed in15 cases (54%). A delayed two-staged operation was done in 6 patients (21%). The two-stage surgical treatment for pyogenic or tubercles spondylitis was used in patients who had bad general condition. ***Lim et al., 2008*** have also seen that anterior surgical approach was used to allow direct access to the focus of infection for aggressive debridement because spondylodiscitis primarily involved anterior vertebral body and adjacent disc spaces.

In the study conducted by ***Ozalay et al., (2010),*** all 16 cases of non-tuberculous thoracic or lumbar spondylodiscitis were treated with anterior debridement and reconstruction (tricortical graft or titanium mesh cage), combined with single-stage posterior instrumentation and grafting.

In the study conducted by ***Heo et al., (2011),*** Among the 19 surgically-treated patients, 10 patients (53%) were managed by the anterior surgical approach only, and 9 patients (47%) were managed with the addition of the posterior approach (combined) in a staged operation. They used a titanium mesh cage for the reconstruction of the anterior column.

In the study conducted by ***Pee et al., (2008),*** the combined approach (a single-stage anterior debridement and fusion followed by posterior instrumentation) was performed.

Although our agreement with other studies in their opinion regarding anterior or combined approach, it was not used in our study, this is because the choice of the surgical approach in our study was limited by two factors; the first was the surgeons experience in that approach, and the second was availability of certain implants as regarding the cost.

Our cases were operated by multiple surgical teams each has its own experience, which also explains the variability of approaches in our study, in contrast to operations in the study of ***Ozalay et al., (2010)*** which were performed by single surgical team who did the same approach in all cases.

In the study conducted by ***Ozalay et al., (2010),*** tricortical iliac auto graft was used, while in in the study conducted by Lee ***et al., (2004),*** wide variations of graft were used (auto graft, allograft from ribs, fibula, humerus, iliac bone, femur and bone morphogenic protein). While, in the study conducted by ***Heo et al., (2011),*** allograft with or without rib graft was used**.** In the study conducted by ***Pee et al., (2008)*****,** autologous iliac bone graft or cage filled with bone chips was used.

Pee et al., (2008), performed a comparison between anterior grafting with titanium mesh cages and autologous bone strut in the treatment of spondylodiscitis. They concluded that anterior interbody fusion with cages followed by posterior pedicle screw fixation can be an effective surgical option in the treatment of pyogenic spondylodiscitis. Not only the titanium mesh cages, but also the titanium cages and PEEK cages were efficient in providing anterior fusion of the infected spine. With additional posterior pedicle screw fixation, both the iliac bone strut and cage groups exhibited no differences in terms of improvement in pain, functional disability, correction of segmental lordosis, and fusion rate. However, the rate of subsidence was higher, and the interval until subsidence was shorter in the strut group than in the cage group.

The operative time in our study ranged from 230 to 390 minutes with a mean of 225 ± 57 minutes which is lower than the mean of 252 minutes reported by ***Ozalay et al., (2010),*** and the mean of 265.35

minutes reported by ***Pee et al., (2008).*** This higher mean in the study of ***Pee et al., (2008) and Ozalay et al., (2010),*** was due to the fact that combined approach was performed in all patients of these studies while in our study, posterior approach was only performed.

Our intraoperative blood loss ranged from 250 to 1500cc with a mean of 424 ± 260cc which was lower than mean blood loss of 820cc in the study conducted by ***Ozalay et al., (2010),*** and the mean blood loss of 711cc in the study conducted by ***Pee et al., (2008).***

All our patients were followed up through a period ranging from 6 to 10 months with a mean of 7 ± 2 months. In the study conducted by ***Lee et al., (2004),*** Follow-up duration ranged from 3 to 54 months (mean duration 21.1 months) while, in the study conducted by ***Pee et al., (2008),*** mean follow-up period was 35.8 months (range 26–50 months). In the study conducted by ***Lim et al., (2008),*** mean follow-up period was 10.9 months, with a range from 6 to 24 months. While, In the study conducted by ***Ozalay et al., (2010),*** minimum follow-up of two years, the average follow-up period was 32.9 months (range: 24 to 48months), finally, the average follow-up period in the study conducted by ***Heo et al., (2011)***, was 11.16 months (range, 6-64 months).

In comparing our mean follow-up period with the other studies, it seems to be the shortest one, but the minimum follow up period was longer than the minimum follow up period published by ***Lee et al., (2004),*** and the same as that published by ***Heo et al., (2011)***.

It is generally agreed that the administration of antibiotics is warranted. But the dosage, route, and duration of antibiotic therapy advocated by various investigators have been extremely contentious. Some authors advocated 6–8 weeks of parenteral therapy alone, while others proposed 6–8 weeks parenteral therapy followed by 2 months or more of oral therapy ***(Beronius et al., 2001and Dimar et al., 2004).***

In our study, generally speaking, the postoperative antibiotics were administered intravenously for 6 weeks, and orally for 6 weeks, and the duration was monitored according to ESR & CRP values, the same regimen was used by ***Pee et al., (2008) and Ozalay et al., (2010).***

Some authors see that insufficient antibiotic administration, such as duration less than 4 weeks, is associated with a high relapse rate (***kuklo et al., 2006).***

The incidence of Complication in our series was 15% (6 cases); one case of intraoperative dural tear (2.5%) which was managed with direct closure with suturing without any post operative leak, Superficial wound infection occurred in three cases (7.5%) which was resolved by superficial debridement, twice daily dressing and antibiotics, Mal-position of transpedicular screws was noticed in one case (2.5%) but without any symptoms and the patient refused a second operation for repositioning and there was no mortality in our series except one case (2.5%) who died 6 months after surgery from chronic renal failure.

Relapse rates cannot be accurately determined as the duration of follow-up is not adequate in most series. Recrudescence of infection is known to occur even years after the original insult was treated. In a series of 253 patients followed up for a median of 6.5 years, relapse was documented in 14%. Three-quarters occurred within the first year, the timing ranging from less than 1 month to as long as 12 years post treatment ***(McHenry et al., 2002).***

In the study conducted by ***Lee et al., (2004),*** the incidence of Complication was 20%. One patient died 3 months post surgery; she suffered a brainstem stroke from hypotension during hemodialysis. There were two graft dislodgements. In one patient a graft extrusion was noted on postoperative Day 1; another patient with renal osteodystrophy had a graft extrusion on postoperative Day 3. In one patient, the fungal source of infection persisted at the site of debridement. This remained unresolved with maximal medical management, and the patient underwent further debridement at that level. In another patient an infection developed at an adjacent level to the interbody fusion. This was managed with appropriate antibiotics. Deep wound infections developed in three patients, two of whom underwent percutaneous drainage of their abscesses. The third patient required another thoracotomy for further debridement of the abscess. One patient with persistent low-grade fevers underwent elective removal of her instrumentation. Cultures from the explants, however, yielded no microorganisms.

In the study conducted by ***Lim et al., (2008),*** Of the 28 patients, 6 patients (21%) developed complication, one patient (3.5%) died from acute respiratory distress syndrome 3 months postoperatively. In another patient, the screws had to be revised because there was posterior screw loosening. Two patients (7%) had superficial wound infection at surgical site but they did not require removal of the implanted material for spondylodesis. Two patients suffered from pleural effusion.

In the study conducted by ***Pee et al., (2008),*** four patients (6.7%) had complications, there was 1 postoperative retroperitoneal hematoma, in which a revision surgery was performed, and there were 3 superficial wound infections on the posterior instrumentation site, which were resutured after debridement.

In the study conducted by ***Ozalay et al., (2010),*** three patients have complication (18.75%) There were

two superficial infections, which healed with debridement and antibiotics. A single iliac vein injury was primarily repaired.

In the study conducted by ***Heo et al., (2011),*** one patient (5%), who had a preoperative diagnosis of diabetes mellitus and adrenal insufficiency, died due to postoperative acute respiratory distress syndrome.

Comparing the incidence of complication in our study with the other series, it is closely the same published by ***Lee et al., (2004),*** and slightly lower than the 21% published by ***Lim et al., (2008),*** but higher than the 6.7% published by ***Pee et al., (2008),*** 18.7% published by ***Ozalay et al., (2010),*** and the 5% published by ***Heo et al., (2011).***

We found a relation between the route of spread of infection and the incidence of complications as all complications in our series occurred in patients with hematogenous spread of infection rather than the postoperative patients.

To the best of our knowledge, the cause of death in all published series was not related to the surgery, the instruments, the persistence or recurrence of infection but it was related to preoperative systemic disease and mostly reflected the compromised health condition of the patients treated.

It was reported that the incidence of infection after spinal instrumentation ranged from 0 to 9.7% which matches with our previous analysis. ***(Chen et al., 2007)***

Chen et al., 2007 compared the conservative fusion surgery with the instrumentation surgery regarding infection recurrence rate, revision rate and mortality rate. The cumulative data in details are outlined in **figure (69).** The incidence of infection recurrence was similar for both groups, so they suggested that the implants did not interfere with the body to combat infection. The more complicated procedures and more reconstruction levels involved for the instrumentation fusion surgeries may explain the higher revision rate and mortality rate.

It was also in our series, stressed that aggressive parenteral and enteral nutritional support was very important in these patients and systemic illness was controlled as possible and any known underlying focus of infection was treated concurrently with the spine infection. This important matter was also put in mind in the study conducted by ***Lim et al., (2008).***

The preoperative WBC count was elevated in 6 patients (15%), The CRP and ESR were elevated in all patients. All laboratory markers showed a highly significant improvement at end of follow up period (p-value <0.001).

In the study conducted by ***Heo et al., (2011)***, the preoperative WBC count was elevated in 10 patients (53%). The CRP level was elevated in 15 patients (79%). The ESR was elevated in most patients (18 from 19 cases). The WBC counts averaged 10,332/μL (range, 3,900-22,360) before surgery and 7,694/μL (range, 4,110-11,500) at discharge. The CRP was 53.48 mg/L (range, 3.4-134) before surgery and 17.76 mg/L (range, 5-41.9) at discharge. The ESR was 64.05 mm/hr (range 4-120) before surgery and 31.78 mm/hr (range, 2-87) at discharge. Most patients had a decrease in WBC count, ESR, and CRP. The preoperative mean value of serum albumin, which was used as a nutritional marker, was 3.06 (range, 2-4).

In our study, as well as in the study conducted by ***Lim et al., (2008),*** ESR, CRP and leukocyte counts returned to normal within 6 months.

In the study conducted by ***Ozalay et al., (2010),*** after surgery, infection was successfully controlled in all patients, and white blood cell count, ESR and CRP returned to normal in a mean of 4.8 months (range, 2 to 6 months).

Neurological status preoperatively and at the end of follow up period were assessed using Frankel classification, the same classification used by ***Lee et al., (2004), Pee et al., (2008), Lim et al., (2008), Ozalay et al., (2010), and Heo et al., (2011).***

the degree of pain preoperatively and at the end of follow up period were evaluated using the Visual Analog Scale (VAS), the same scale used by ***Pee et al., (2008) Lim et al., (2008), and Heo et al., (2011).***

The functional assessment in our study was done with Barthel index, but ***Pee et al., (2008),*** used Oswestry Disability Index (ODI), and ***Ozalay et al., (2010)*** used modified macnab criteria, although ***Lee et al., (2004)***, did not used any specified scale in the the functional assessment.

In our study, 34 patients (85%) were classified as Frankle E Prior to surgery; three patients (7.5%) were classified as Frankel type A, three (7.5%) as Frankel type C. After surgery, the neurological status changed in five patients and improved by 2 Frankel grade in four patients and one patient improved by one Frankle grade. The only patient, who did not improve postoperatively, had previous surgical intervention for the same cause in the form of laminectomy without fixation with instruments which leaded to complete collapse of the affected vertebral body and severe kyphotic deformity. The overall p-value for outcome in Frankle scale was significant (<0.05).

In the study conducted by ***Lim et al., (2008),*** the mean Frankel scale in preoperative state was 3.78±0.70, and this was improved to 4.78±0.35 at final follow-up.

In the study conducted by ***Pee et al., (2008),*** Preoperative neurological deficits were noted in 16 of the 60 patients. In terms of Frankel grade, 11 of the patients have improved during the follow-up period, and 5 have remained the same since the last follow-up.

In the study conducted by ***Ozalay et al., (2010),*** All 7 patients with a neurological deficit improved, according to The Frankel classification.

In the study conducted by ***Heo et al., (2011),*** prior to surgery, two patients were classified as Frankel type A, two as Frankel type C, and 15 as Frankel type D. After surgery, the neurological status changed in seven patients and improved by 1 Frankel grade. One patient, who had a preoperative diagnosis of diabetes mellitus and adrenal insufficiency, died due to postoperative acute respiratory distress syndrome. There was no recurrence of infection in patients who received nearly radical debridement of the infected tissue followed by reconstruction using a titanium mesh cage.

In our series, it has been noticed that the neurological Outcome after surgery for spondylodiscitis was determined mostly by preoperative neurological state, a similar finding in most published series.

Ouellet et al., (2008) stated that Neurological worsening due to surgery is unusual, and postoperative neurological deterioration is often associated with recurrence.

In our study, the mean VAS score was 8 ± 1 (range, 6 -10) before surgery and 2 ± 1 (range, 1- 4) at end of follow up period with a highly significant p-value (<0.001). In the study conducted by ***Lim et al., (2008),*** Mean VAS score at preoperative period was 7.43±0.54, and was 2.07±1.12 at final follow up. This means that improvement in vas score in our study matches that in the studied series of ***Lim et al., (2008).***

In the study conducted by ***Pee et al., (2008),*** the mean preoperative VAS scores and ODIs of all patients were 8.63 and 76.2%, respectively, Improvement in VAS scores (that is, the difference in scores between preoperative and last follow-up) was 5.5. Improvement in ODIs was 48.6%.

In the study conducted by ***Heo et al., (2011),*** the mean VAS score was 7.8 (range, 4-10) before surgery and was 2.4 (range, 1-5) after surgery which was closely similar to our results.

In our study, the mean Barthel index was 45 ± 16 (range, 10 -70) before surgery and 90 ± 18 (range, 65-100) at end of follow up period with a highly significant p-value (<0.001). There was no recurrence of infection in all patients till the end of follow up period.

In the study conducted by ***Ozalay et al., (2010),*** the clinical outcome was assessed according to the modified Macnab criteria (30): 4 different grades from excellent to poor. At final follow-up, 14 patients (87.5%) were completely relieved of pain and 2 (12.5%) had mild residual pain which did not interfere with their daily activities or require regular analgesics. According to Macnab's criteria, these 14 patients (87.5%) had an excellent result and 2 (12.5%) a good result. These findings were consistent with other published literature ***(Kuklo et al., 2006 & Sundararaj et al., 2007)***.

Radiographically, there was subsidence of all signs of infection, no instrumentation related complication. failures, such as expulsion or migration of any implanted cage or pullout of the transpedicular screws, there have been no recurrence of infection and no evidence of secondary infection due to spinal instrumentations.

All films demonstrated adequate fusion in all patients with bone graft, based on the presence of bone trabeculae in the graft site; in addition, all patients attained improvement (or normal results) in their sagittal alignment compared with findings on their preoperative imaging.

In the study conducted by ***Lim et al., (2008),*** Successful interbody bony fusion rate was observed in 27 patients from 28 (96% fusion rate, except one patient who died of miliary tuberculosis aggravation).

In the study conducted by ***Ozalay et al., (2010),*** Radiological evaluations were performed by one investigator blinded to the clinical outcome in order to abolish any bias. Bony fusion with incorporation of the graft was achieved in all patients. All infections had resolved without recurrence. There were no hardware problems. As to the kyphotic angle, there was an average correction of 12.7° postoperatively, decreasing to 10.7° after a minimum follow-up of 2 years, which means an average loss of 2°.

As stated by ***Hadjipavlou et al., (2000)*** posterior stabilization through instrumentation was the critical factor in these improved results. The authors believe that posterior instrumentation and grafting is the principal stabilizer of the vertebral column in order to achieve a successful fusion.

In the study conducted by ***Heo et al., (2011),*** the radiographic analysis included the preoperative, immediate postoperative, and last follow-up assessment of the sagittal profile (kyphotic angle) as measured by the angle between the endplate above and below the infected vertebrae. There were no instrumentation failures, such as expulsion or migration of any implanted titanium mesh cage or pullout of the transpedicular screws.

Conclusion:

At the end of this work, it can be concluded that:

- The majority of early stage spondylodiscitis responds well to conservative treatment. Surgical intervention Success was obtained in both groups especially the excellent results were with instrumentation group.
- instrumentation can relieve pain, improve sagittal balance and neurologic function, and finally

result in early ambulation, so we concluded that posterior instrumentation methods after aggressive debridement is a highly effective and safe method in the treatment of spondylodiscitis in selected patients. If the debridement of infected tissue is complete, instrumentation shows neither persistence nor recurrence of secondary infection and does not prolong the usage of antibiotics and hospitalization.

❖ Further double-blinded and randomly controlled prospective study and multicenter cooperation would be necessary to draw a more definite conclusion.

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