Abstract:
Background: Posterior plating utilizing lateral mass screw fixation has been widely accepted for treating the unstable cervical spine caused by trauma, neoplasms, significant degenerative conditions, and failed anterior fusions.
Objective: The aim of this study is to evaluate the outcome and complications of decompressive cervical laminectomy and lateral mass screw fixation in patients treated for variable cervical spine pathologies.
Patients and Methods: This retrospective study was conducted on patients with unstable cervical spine in the period of two years. Patients were admitted and operated upon in the Department of Neurosurgery, in Banha University Hospitals from October 2015 to October 2017 and followed up for 12 to 18 months later. Postoperatively, patient's myelopathy grade and functional status was evaluated immediately after operation then weekly for the 1st month then every 3 months for the 1st year and every six months in the 2nd year.
Results: Evaluation of the postoperative myelopathy was carried out immediately postoperatively and during six months using Nurick's myelopathy grading and neck disability scale. Statistical analysis revealed that there is a significant increase of cases of grade 1 post-operatively than those pre-operatively and a decrease in both number of cases of grade 2 and grade 4 post-operatively than pre-operatively. While other grades did not show any significant change in their figures post-operatively compared to their figures pre-operatively.
Keywords:
Lateral mass, cervical laminectomy, myelopathy, Brachialgia.

1-Introduction:
Posterior cervical fixation with lateral mass screws has been increasingly used since the concept was first described by Roy-Camille in 1979 (Roy-Camille R, et al).
Lateral mass fixation has the advantage over interspinous wire fixation by achieving increased rigidity, lower incidence of loss of reduction, and decreased postoperative brace requirements. Additionally, lateral mass fixation is used effectively when lamina or spinous processes are missing or fractured, for multi-segmental instabilities and when extension is required to the occiput or thoracic spine (Anderson PA, et al).
Lateral mass fixation is indicated to treat cervical instability with fractured or absent posterior elements, multilevel instabilities, fracture dislocation with locked facet or ligamentous injury and when extension to the thoracic spine is desired. Additionally, it is indicated for the treatment of pseudo-arthritis of anterior cervical arthrodesis, in multilevel instability after decompressive laminectomy in cervical stenosis, and in reconstruction of tumorous conditions (Anderson PA, et al).

2-Patients and methods:
This hospital based retrospective study was conducted on patients with unstable cervical spine in the period of two years. Patients were admitted and operated upon in the Department of Neurosurgery, in Banha University Hospitals from October 2015 to October 2017 and followed up for 12 to 18 months later.
All patients’ data, diagnosis and treatment outcomes are confidentially kept private and patients are presented by specific codes. All patients consented and asked to volunteer for the study and the ethical committee of the hospital asked for the written informed consent for this study.
I. Pre-operatively:
All patients were evaluated and subjected to the following:
1. Clinical history.
2. Clinical examinations: A complete thorough general and neurological examination was performed.
3. Routine laboratory investigation.
4. Radiological assessment.
Plain radiography including: lateral, anteroposterior, flexion-extension dynamic study (with high precautions in unstable fractures), and odontoid view.
CT was done for the all cases.
MRI was done for all cases using T1, T2 images. Axial cuts as well as sagittal planes. It is more superior for giving details for neural elements.

II. Operative procedure:

1. Preparation:
   All the patients were intubated while they were wearing hard neck collar.
   Following intubation, the patient is positioned on the operating table in the prone position using three pin head holder. The head moved into few degrees of flexion to open the interspinous spaces. (Fiore AJ, et al. 2002).

2. Operative technique:
   A- Skin incision.
   B- Exposure of the interspace: The musculature was dissected from the midline laterally.
   C- Screw and Rod application: After exposure of the posterior elements, An awel was used to make a shallow holes 2 mm medially and above center of posterior surface of the lateral mass then the drill was used to drill a hole 1 cm deep in the lateral masses bilaterally with the technique described by Magerl with 20 degree to 25 degree lateral and cranial angulations parallel to the joint line of the adjacent facet. The length of screws was 12-14 mm and the diameter was 3.5 mm. A rod of appropriate size were selected and bent to match the contour of the lateral masses. (Sang HK, et al. 2007).
   We do decompression laminectomy after putting the screws and rods to avoid injury to the spinal cord.
   The facet joints at the levels to be fused were curetted of synovium and packed with bone grafts taken from the spinous processes.

III. Postoperative Follow-up:

1. Clinical follow up:
   Postoperatively, patient's myelopathy grade and functional status was evaluated immediately after operation then weekly for the 1st month then every 3 months for the 1st year and every six months in the 2nd year.

2. Radiological Follow-up:
   Plain x-ray cervical spine (anteroposterior, lateral and open mouth view) and or CT of the cervical spine to check screw position within 72 hours and every 2 month up to six month to detect any developing kyphus and to assess the degree of fusion.

3-Results:
   This study included 10 patients suffering from cervical instability.
   7 out of the 10 patients (70%) are males while 3 out of the 10 patients (30%) are females with a male to female ratio of 2.3:1.
   The age of the patients is ranged between 30 to 59 years with a mean age of 47.2(±10) years. Cervical instability is more common in the age group 40-49 years (50%) followed by age group 50-59 years (40%) and least presented in age group 30-39 years (10%).
   All patients were operated in the prone position for posterior cervical fixation, decompressive laminectomy using micro motor drill and removing the laminae en-bloc after resection of the ligamentum flavum or by using the bone nibbler and removing the lamina bit by bit. The extent of the laminectomy was from C3 to C7.
   Only one patient had neural injury due to root injury and the screw was corrected. In 2 cases there was a lot of bleeding due to the venous plexus and not due to vascular injury.
   Post-operative there was no CSF leak or wound infection only one patient presented by C5 radiculopathy which improved on medical treatment.
   Evaluation of the postoperative myelopathy was carried out immediately postoperatively and during six months using Nurick's myelopathy grading and neck disability scale. Statistical analysis revealed that there is a significant increase of cases of grade 1 post-operatively than those pre-operatively and a decrease in both number of cases of grade 2 and grade 4 post-operatively than pre-operatively.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Duration of myelopathy</th>
<th>Pre-operative</th>
<th>Post-operative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>Grade 0</td>
<td>2-8 week</td>
<td>2</td>
<td>20%</td>
</tr>
<tr>
<td>Grade 1</td>
<td>--</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Grade 2</td>
<td>1-18 month</td>
<td>5</td>
<td>50%</td>
</tr>
<tr>
<td>Grade 3</td>
<td>1-2 years</td>
<td>2</td>
<td>20%</td>
</tr>
</tbody>
</table>
Decompressive cervical laminectomy and lateral mass screw-rod arthrodesis: Surgical analysis and outcome

<table>
<thead>
<tr>
<th>Grade 4</th>
<th>2 week - 18 month</th>
<th>1</th>
<th>10%</th>
<th>1</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistical test</td>
<td></td>
<td></td>
<td>2.21</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P value</td>
<td></td>
<td></td>
<td>0.70</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Showing improvement in the symptoms postoperative

![Figure 1](image1.png)

Figure [1]: Showing improvement in the symptoms postoperative

<table>
<thead>
<tr>
<th>Raw Score</th>
<th>Pre-operative</th>
<th>Post-operative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>0-4</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>5 – 14</td>
<td>2</td>
<td>20%</td>
</tr>
<tr>
<td>15 – 24</td>
<td>6</td>
<td>60%</td>
</tr>
<tr>
<td>25 – 34</td>
<td>2</td>
<td>20%</td>
</tr>
<tr>
<td>Statistical test</td>
<td></td>
<td>2.63</td>
</tr>
<tr>
<td>P value</td>
<td></td>
<td>0.45</td>
</tr>
</tbody>
</table>

Table 2: Showing pre-operative and post-operative neck disability score.
Decompressive cervical laminectomy and lateral mass screw-rod arthrodesis: Surgical analysis and outcome

Figure 2: Showing pre-operative and post-operative neck disability score.

4-Discussion:
Our patients are examined and their records are reviewed: the male/female ratio is 2.3:1 (7 males and 3 females).
Kim et al., 2012 is agreed with us in which thirty-nine patients underwent posterior cervical lateral mass screw fixation there were 32 male and 7 female subjects with ages ranging from 27 to 79 years old with the mean age of 54.26 years old. And Al-Barbarawi et al., 2011 which was a retrospective review of 110 patients their ages ranged from 16-68 years (40 females and 70 males).
In our study 10 patients with cervical pathology (7 patients with symptomatic degenerative cervical spondylosis and 3 cervical spine injuries) so the main pathology is cervical myelopathy due to cervical canal stenosis reflecting that the increase in the incidence of degenerative cervical spondylosis in our country due to the nature of heavy work.
In considering the degenerative cervical spondylotic disease as the most frequent pathology in our study other previous study agreed with this, In Sang et al, 2007. Lateral mass screws were implanted in 65 separate patients. The lesions included 18 cases of tumors, 31 cases of degenerative disease including ossification of the posterior longitudinal ligament (OPLL), 14 cases of trauma and one case each of rheumatoid arthritis and Klippel-Feil Syndrome.
In our study there were an improvement in Nurick's grade in 60% of myelopathic cases, no improvement in 30% of these cases and 10% of patients had neurological deterioration after surgery but we consider severe and long duration of myelopathy with myelomalacia on preoperative magnetic resonance imaging as a prognostic factors for improvement of myelopathy after surgery as patients with these criteria always have vascular ischemia in the cervical cord and it is the main cause of no improvement in some cases after surgery for decompression and fixation.
In the study by Komotar et al, 2006 there were an improvement in Nurick's grade in 22 patients (71%), 1.9% of patients show no improvement and no patients had neurological deterioration. They considered severe myelopathy, long duration of myelopathy and myelomalacia on preoperative magnetic resonance Imaging were of no prognostic value for improvement of myelopathy.
In our study all cases are operated with a polyaxial screw-rod construct and screws are placed by using Magerl's trajectory. All patients had 12-14-mm length and 3.5 mm diameter screws placed for sub axial lateral mass. Screw location is assessed by intra-
operative plain X-ray. In our study for the cases of cervical degenerative spondylolisthesis post-operative relief of brachialgia is achieved in 50% of patients presented with brachialgia, and only 80% of those having neck pain improved and the remaining patients were the same, and gait heaviness improved in 83% of patients presented with lower limbs heaviness and sphincteric manifestation improved only in 30% of patients presented with sphincteric deficits. So our results agreed with the study conducted by Houten and Cooper in 2003 they did laminectomy from C3-C7 with immediate stabilization with lateral mass fixation for spondylotic degenerative cervical disease. Numbness improved in 91% and the remaining patient were the same as preoperative, gait heaviness improved in 93% and remains the same in the rest of patients and sphincteric manifestation improved in only 57%. In our study, the elder patients had less postoperative improvement in myelopathy and disability score due to the longer the duration of symptoms which is statistically nonsignificant. In the study published by Fehlings et al. 2008 it was concluded that there's no correlation between the age of patient and the surgical outcome. But in our study we found that the age and the longer the duration of symptoms affect negatively outcome in cervical myelopathy as with the increase in the duration of symptoms not only the mechanical compression became the attributed factor but also there is a vascular compromise factor.

5-Conclusion:
Posterior cervical fixation using screw-rod system is considered an important procedure in producing immediate stability of the cervical spine, prevents kyphotic deformity, and probably precludes further development of spondylolisthesis at fused levels in the cervical spondylotic disease. Lateral mass fixation in traumatic cervical spine injury is a golden technique which provides a high safety intervention and high efficacy even with posterior compartment fractures. The technique requires proper selection of cases before surgery and meticulous attention during surgery to identify the correct starting point, screw orientation drilling depth and screw length selection. Neurological outcome is satisfied without major complications.

6-References: