ABSTRACT
OBJECTIVES
To evaluate the efficacy of Occipitocervical Fixation (OCF) in patients with craniocervical instability in two tertiary care hospitals.

METHODOLOGY
This retrospective case series study was conducted at Hayatabad Medical Complex, Peshawar, from April 2017 to December 2020. A non-probability sampling technique was used, and size was calculated via online software with a 95% confidence level and 5% margin of error. All patients with craniocervical instability were included in our study, and those having occipital bone fractures or previously operated patients with the same technique were excluded from the study. The Nurick score was used to assess neurological function pre-and postoperatively. The demographic details of the patients, clinical features, radiographic findings (pre- and postoperative), and clinical outcomes using the Nurick myelopathy grading system were noted and entered into a structured proforma. All data were entered into SPSS Version 18 and analyzed. The results were presented in tables and pictures.

RESULTS
A total of 26 cases with craniocervical instability underwent OCF. The mean age of the patients was 40.5 ± 1.2 SD years. There were 10 male patients and 16 female patients. The majority of patients showed improvements in myelopathic symptoms after the operation. The mean preoperative Nurick score was 3.0. At the end of follow-up after surgery, the mean Nurick score was 2.1. There was a total of 7 (14.28%) cases having complications, of which 4 (8.16%) patients had wound infection, 2 (4.08%) patients had implant failure, and 1 (2.04%) had vertebral artery injury. However, no postoperative neurological deficit was observed.

CONCLUSION
Occipitocervical fixation is a reasonable option to have spinal stability, achieve bone fusion and get neurological improvement. Certain conditions complicate the procedure, but experienced hands can safely handle these.

KEYWORDS: Craniocervical Instability, Occipitocervical Fusion, Nurick Grading System

INTRODUCTION
The occipitocervical junction Instability is a well-known neurosurgical condition in which there may be severe suboccipital pain or neurological symptoms and signs due to compression of the spinal cord or medulla oblongata leading to progressive functional disability.\(^1\)

The surgical approach to this region is challenging due to complex bony and soft tissue anatomy. Cranio cervical region instability may be congenital, traumatic, inflammatory, i.e. rheumatoid arthritis, infective, degenerative or due to malignancy involving the upper cervical spine.\(^2\) The surgical intervention aims to restore spinal alignment, decompress neural tissue and achieve bony fusion. Various surgical procedures are in the armamentarium of spine surgeons to treat this pathology, as until this date, no uniformity exists in treating this pathology. One of the best ways to treat this condition is occipitocervical fusion (OCF), in which both bony fusion and instrumental fixation are done. The purpose of OCF is to give stability to occipitocervical junction, reduce displacement, correct the deformity and decompress neural structures. Instrumental fixation gives immediate mechanical stability, improves bony fusion rate, decreases postoperative external immobilization requirements, and shortened rehabilitation time is also shortened.\(^1\)

Various techniques of OCF, such as screw-rod, occipitocervical hook and wiring, are currently available, and they all have been shown to have high fusion rates (89-100%).\(^3,4,5,6,7\) Screw-rod fixation allows for strong biomechanical fixation and gives immediate
stability after surgery. However, like any surgical procedure, certain complications may also occur during OCF, which include vertebral artery injury, dural tear causing cerebrospinal fluid (CSF) leakage, wound infection, injury to neural tissue, implant failure and failure of bony fusion. Occipitocervical fusion for craniocervical instability is a challenging procedure performed in very few centres in Pakistan. In addition, this procedure needs a highly equipped Operation theatre and expert Neurosurgeon. It aims to observe its outcome, compare results with national and international studies, and suggest its usefulness.

METHODOLOGY

We retrospectively reviewed a series of consecutive patients with craniocervical instability in the neurosurgery department of Hayatabad Medical Complex Peshawar from April 2017 to December 2020. A non-probability purposive sampling technique was used, and the sample size was calculated via online software with a 95% confidence level and 5% margin of error. All patients having craniocervical instability who underwent occipital cervical fusion using rod and screw construct were included in our study. Patients having occipital bone fractures or previously operated patients with the same technique were excluded from this study. Lateral static and dynamic X-rays were taken in all patients before the operation, after the operation and during the last follow-up. We retrospectively reviewed all charts/files for demographic profiles and pre-and postoperative assessments of neurologic status. All data were entered into SPSS Version 18 and analyzed. The results were presented in tables and pictures. The surgery was performed with the patient in the prone position. A midline incision was given in all patients, from the external occipital protuberance to the desirable cervical area. After adequate exposure of the suboccipital and posterior cervical areas, occipital screws and plate and either C2 pedicle screws or C3, 4, and 5 lateral mass screws were placed. Rod fixation was then performed. Decompression was done as needed. The patients were observed for postoperative complications in early and late follow-up periods.

RESULTS

A total of 26 cases with craniocervical instability underwent OCF. The mean age of the patients was 40.5 ±1.2 SD years.
Table 1: Shows the Various Etiologies of Craniocervical Patients

<table>
<thead>
<tr>
<th>Etiology</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma</td>
<td>16</td>
<td>61.5</td>
</tr>
<tr>
<td>Degenerative spine</td>
<td>04</td>
<td>15.3</td>
</tr>
<tr>
<td>Basilar invaginations</td>
<td>03</td>
<td>11.5</td>
</tr>
<tr>
<td>Os Odontoideum</td>
<td>02</td>
<td>7.6</td>
</tr>
<tr>
<td>Rheumatoid Arthritis</td>
<td>01</td>
<td>3.84</td>
</tr>
</tbody>
</table>

Most patients showed improvements in myelopathy symptoms after the operation, i.e. n=43 (87.75%). The mean preoperative Nurick score was 3.0. At the end of follow-up after surgery, the mean Nurick score was 2.1. Neck pain was relieved in 45 (91.83%) patients after bony fusion. Various clinical presentations are given in Table 2.

Table 2: Clinical Presentation

<table>
<thead>
<tr>
<th>Presentation</th>
<th>No</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preoperative Neck pain</td>
<td>21</td>
<td>80.7%</td>
</tr>
<tr>
<td>Cranial nerve deficits</td>
<td>05</td>
<td>19.2%</td>
</tr>
<tr>
<td>Motor problems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unstable gait</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cranial nerve deficits</td>
<td>05</td>
<td>19.2%</td>
</tr>
<tr>
<td>Shoulder drop</td>
<td>02</td>
<td>6.3%</td>
</tr>
<tr>
<td>Sphincters</td>
<td>01</td>
<td>3.07%</td>
</tr>
<tr>
<td>Parasthesias</td>
<td>08</td>
<td>30.7%</td>
</tr>
</tbody>
</table>

Surgical complications

Various complications occurred in 7 (14.28%) cases. 4 (8.16%) patients had wound infection, 2 (4.08%) patients suffered implant failure, and 1 (2.04%) had vertebral artery injury. However, no postoperative neurological deficit was observed. Figure 2: show some of the complications.

DISCUSSION

Foerster, in 1927, was the first person to report OCF and use nasal bone as a graft. A great deal of modification has occurred since then regarding implant use and graft source. Various etiological factors cause craniocervical instability through various mechanisms. Os odontoideum forms a separate bone structure due to abnormal fusion between the odontoid process of the second cervical vertebra and the body. Without a united odontoid process, the atlanto axial movements appear to be supported only by ligaments, resulting in atlantoaxial instability. According to some authors, in minimally symptomatic or asymptomatic patients with Os odontoideum without C1-2 instability, good treatment outcomes can be obtained using conservative management without surgical treatment. Rheumatoid arthritis of the cervical spine leads to a spectrum of joint erosions and deformities resulting in spinal stability. Atlanta-occipital dislocation is another indication of OCF because it can lead to death without treatment. Craniovertebral tuberculosis may lead to Atlanto axial dislocation or bone destruction and granulation, which may require anterior decompression and posterior fusion. Occipitocervical fixation has been done in all our study populations with or without decompression. Improvement in the myelopathy symptoms can be seen in most of the patients enrolled in the study population. Most patients show improvement in myelopathy symptoms after the operation, i.e. n=43 (87.75%). The mean preoperative Nurick score is 3.0. At the end of follow-up after surgery, the mean Nurick score is 2.1. Neck pain subsided in 45 (91.83%) patients after bony fusion in our study. Choi SH reported in his research improvements in myelopathy symptoms after the operation, i.e. n=43 (87.75%). The mean preoperative Nurick score is 3.0. At the end of follow-up after surgery, the mean Nurick score is 2.1. Neck pain subsided in 45 (91.83%) patients after bony fusion in our study. Choi SH reported in his research improvements in myelopathy symptoms after the operation, i.e. n=43 (87.75%). The mean preoperative Nurick score is 3.0. At the end of follow-up after surgery, the mean Nurick score is 2.1. Neck pain subsided in 45 (91.83%) patients after bony fusion in our study. Choi SH reported in his research improvements in myelopathy symptoms after the operation, i.e. n=43 (87.75%). The mean preoperative Nurick score is 3.0. At the end of follow-up after surgery, the mean Nurick score is 2.1. Neck pain subsided in 45 (91.83%) patients after bony fusion in our study. Choi SH reported in his research improvements in myelopathy symptoms after the operation, i.e. n=43 (87.75%). The mean preoperative Nurick score is 3.0. At the end of follow-up after surgery, the mean Nurick score is 2.1. Neck pain subsided in 45 (91.83%) patients after bony fusion in our study. Choi SH reported in his research improvements in myelopathy symptoms after the operation, i.e. n=43 (87.75%). The mean preoperative Nurick score is 3.0. At the end of follow-up after surgery, the mean Nurick score is 2.1. Neck pain subsided in 45 (91.83%) patients after bony fusion in our study. Choi SH reported in his research improvements in myelopathy symptoms after the operation, i.e. n=43 (87.75%). The mean preoperative Nurick score is 3.0. At the end of follow-up after surgery, the mean Nurick score is 2.1. Neck pain subsided in 45 (91.83%) patients after bony fusion in our study. Choi SH reported in his research improvements in myelopathy symptoms after the operation, i.e. n=43 (87.75%). The mean preoperative Nurick score is 3.0. At the end of follow-up after surgery, the mean Nurick score is 2.1. Neck pain subsided in 45 (91.83%) patients after bony fusion in our study. Choi SH reported in his research improvements in myelopathy symptoms after the operation, i.e. n=43 (87.75%). The mean preoperative Nurick score is 3.0. At the end of follow-up after surgery, the mean Nurick score is 2.1. Neck pain subsided in 45 (91.83%) patients after bony fusion in our study. Choi SH reported in his research improvements in myelopathy symptoms after the operation, i.e. n=43 (87.75%). The mean preoperative Nurick score is 3.0. At the end of follow-up after surgery, the mean Nurick score is 2.1. Neck pain subsided in 45 (91.83%) patients after bony fusion in our study. Choi SH reported in his research improvements in myelopathy symptoms after the operation, i.e. n=43 (87.75%). The mean preoperative Nurick score is 3.0. At the end of follow-up after surgery, the mean Nurick score is 2.1. Neck pain subsided in 45 (91.83%) patients after bony fusion in our study. Choi SH reported in his research improvements in myelopathy symptoms after the operation, i.e. n=43 (87.75%). The mean preoperative Nurick score is 3.0. At the end of follow-up after surgery, the mean Nurick score is 2.1. Neck pain subsided in 45 (91.83%) patients after bony fusion in our study.
Occipital screw pullout strength. Likewise, the pullout strength of a bicortical screw purchase is 50% more than unicortical screw purchase.24 Vertebral artery injury while passing a C2 pedicle screw or C1C2 trans articular screw fixation is a well-recognized complication, and various authors have reported various ranges. In our study, 1(2.04%) patient had vertebral artery injury, which we came across while dissection around CV2. We controlled it with pressure and did not proceed with a pedicle screw on this side. A subsequent angiogram revealed no issue with vertebral artery anatomy. The incidence of vertebral artery injury was 6.3% in the Choi SH2 report, slightly higher than ours, but their study population is less than ours. True incidence requires more extensive studies with big cohorts. Our study did not find any persistent CSF leak after surgery, though literature has quoted it in the range of 25-28% in some studies.46 The craniocervical instability is a treatable surgical entity. However, the best type of surgery largely depends on the instability type, the status of posterior cervical elements, the amount of decompression, the general condition of the patient, anatomical variation and the surgeon's experience with a particular approach. Our study has few patients and arrives at the best surgical treatment. More studies are needed to recommend any specific surgical approach for any specific disorder of the craniocervical junction causing instability and neurological complications.

LIMITATIONS

It was confined to a limited number of patients with a short follow-up period. Secondly, only Hayatabad Medical Complex was taken as the study place. Including other hospitals from the same locality could have given a better idea about this procedure’s effectiveness.

CONCLUSIONS

Occipitocervical fusion is a reasonable option to have stability, achieve bony fusion, decompress neural tissues, and achieve a good functional outcome. Most of the complications can be managed safely by experienced hands.

CONFLICT OF INTEREST: None

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REFERENCES


CONTRIBUTORS
1. Sohail Amir – Concept & Design; Data Acquisition; Data Analysis/Interpretation; Drafting Manuscript
2. Shahid Ayub – Critical Revision; Supervision; Final Approval