

# FREQUENCY OF IMPROVEMENT IN ANATOMICAL ALIGNMENT OF CERVICAL SPINE WITH SKELETAL TRACTION IN PATIENTS WITH CERVICAL SPINE INJURY

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## ABSTRACT

**OBJECTIVE:** To determine frequency of improvement in anatomical alignment of cervical spine with skeletal traction in patients with cervical spine injury.

**METHODOLOGY:** This retrospective observational study was conducted at neurosurgery department, Lady Reading Hospital, Peshawar. The medical record of all cases from December 2010 to November 2011, in which cervical traction was applied for cervical spine injury, was retrieved. Documentation was done according to proforma designed, indicating age, sex, status of radiological alignment of cervical spine before and after cervical traction and investigations with findings on X-rays, CT and MRI. The data was analyzed with respect to mechanism of injury, type of injury, duration of traction, and reduction outcome.

**RESULTS:** Out of 33 patients with cervical spine injury, 21 (63.6%) were males and 12 (36.4%) were females. The age of the patients ranged from 13-80 years with mean age of 32.33 ± 16.30 years. Majority of the patients (n=20, 60.6%) were young, ranging in age from 13-30 years. Complete radiological alignment was achieved in 20 (60.6%) cases, partial alignment in 2 (6.1%) cases and no alignment was successful in 11 (33.3%) cases. Traction was most effective in patients with C5- C6 cervical subluxation (n=13, 86.7%). Improvement was noted in 100% (n=9) of patients with posterior subluxation.

**CONCLUSION:** Skeletal cervical traction is safe and effective means of early decompression of spinal cord and establishing and maintaining alignment of cervical spine by close reduction. It is more effective in young individuals particularly those with subaxial spinal instability due to extension type of injury.

**KEY WORDS:** skeletal traction, improvement, cervical spine, anatomical alignment. stress.

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## INTRODUCTION

Skeletal cervical traction is defined as the longitudinal pull along the cervical

spine that restores normal anatomic alignment by reducing deformity, and provides stabilization. In fracture dislocation, skeletal traction restores the

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diameter of cervical canal, by pulling out the fractured fragments of the spine apart and reduces the risk of spinal cord compression.<sup>1</sup>

Cervical traction is mainly of two types; (1) skin traction e.g. head halter traction (2) skeletal traction e.g. Gardner-wells tongs and cranial halo traction.<sup>2</sup> Complete reduction is ideal while satisfactory reductions means less than 3mm of decrease in the anteroposterior diameter of the spinal canal.<sup>3,4</sup>

Optimal weight of traction is controversial. If the injury is higher up in the spine, less traction will be required but for lower level injuries, more weight will be needed. According to Crutchfield's rule ten pounds distract the head, and 5 additional pounds are added for each interspace.<sup>1,5,6</sup> For reduction of cervical facet dislocations, weights are serially added with the neck in position of flexion. After each 2.5 kg weight increment, a lateral X-ray cervical spine is taken to determine reduction. After reduction, the neck is extended and then maintained on lighter weight.<sup>2,7,8</sup> Periodic neurological examination and radiologic imaging is mandatory during traction to avoid over distraction that may pull fragments in canal in C1-C3 posterior elements fracture.<sup>9</sup>

Cervical traction is indicated for; (a) Temporary stabilization to preserve neurologic function in trauma patients. (b) Preoperative reduction in patients with deformity or displaced fractures. (c) Intraoperative stabilization and interspace distraction for anterior grafting.

Various risks and complications include worsening of neurology due to excessive manipulation, pulling out of tongs due to improper positioning, infection at pin sites, occipital decubitus ulcer and penetration of inner table.<sup>9,10</sup>

Various international studies have shown that frequency rate of improvement in anatomical alignment after cervical traction is 43%,<sup>11</sup> 55.5%,<sup>12</sup> 58%,<sup>13</sup> 66.7%<sup>14</sup> and 88%.<sup>15</sup> There was no national data purely on the topic. Therefore, the objective of this study was to create local statistics on success rate of cervical traction in terms of improvement in anatomical alignment of cervical spine in patients with cervical spine injury. If it proved to be effective, it will be recommended to improve quality of life in patients with cervical spine injury.

## MEHTODOLOGY

We conducted a retrospective observational study in all those patients who had presented with signs and symptoms of unstable cervical spine injuries, necessitating cervical traction. Application of cervical traction was decided on the basis of radiological findings. In all cases, Gardner wells tongs were applied because of easy application and availability. Patients with normal spine alignment or seriously ill with respiratory distress that died within 24 hours of cervical traction, were excluded from study. All of these patients presented in emergency and cervical traction was applied on the same day.

Medical record of the patients was collected according to designed proforma indicating age, sex, status of radiological alignment of cervical spine before and after cervical traction and investigations with findings on X-rays, CT and MRI. MRI was done in all patients on the basis of neurological injury and anatomical injury on plane X ray. Sampling was done according to consecutive sampling method. The data was analyzed from different

angles in SPSS software.

Any change in radiological status immediately after applying cervical traction, weight increment and then every 24 hours till patient was discharged, died or operated, was noted. Achievement of complete or satisfactory reduction, interpreted by consultant, (less than 3mm of decrease in the anteroposterior diameter of the spinal canal) after cervical traction, based on plain X-ray cervical spine, was considered an improvement in anatomical alignment. (Figure 1, 2 & 3).

## RESULTS

A total of 33 patients were included in the study. There were 21(63.7%) males and 12(36.3%) females with male to female ratio of 1.7 to 1. Majority of patients in our study were from Peshawar, (42.4%) followed by hilly areas like Swat, Buner, Dir etc comprising 30.3% of the sample size. The age ranged from 13-80 years (mean=32.33 + 16.30 years). The bulk mainly consisted of young active individuals with 27 (81.8%) having age of 40 years or less (Table 1).

Anterior subluxation between the two vertebral level was the most common injury (42.4%) followed by posterior subluxation in 9 (27.3%) of patients. Other less common injuries were compression fracture with fragmentation and retropulsion and bilateral facet dislocation that were noted in 18.2% and 12.1% of patients respectively.

As far as level of injury is concerned, spinal instability was most frequently found at C5- C6 level (45.5%, n=15). The next commonly affected level C6-C7 was noticed in 8 (24.2%) patients. C3- C4 was the least affected level (in 3% of patients, n=1) while atlantoaxial, C2- C3 and C4- C5 was found to be injured in 3 patients each (9.1%).

As a whole, complete radiological alignment was achieved in 20 (60.6%) patients with cervical traction while in 11



Figure 1: Cervical traction for C5-C6 subluxation



Figure 2: MRI showing C5-C6 subluxation before reduction



Figure 3: X-ray spine after reduction patients; there was no evidence of reduction of subluxation (table II). Complete reduction was obtained in 86.7% (n=13) of patients with C5- C6 subluxation

**TABLE I: AGE WISE DISTRIBUTION OF PATIENTS**

Age Range	Frequency (n=33)	Percentage
13-20 years	9	27.3
21-30 years	11	33.3
31-40 years	7	21.2
41-50 years	2	6.1
51-60 years	2	6.1
61-70 years	1	3.0
71-80 years	1	3.0

**TABLE II: OVERALL IMPROVEMENT IN ANATOMICAL ALIGNMENT**

	Frequency	Percentage
Complete reduction	20	60.6
Partial reduction	2	6.1
No reduction	11	33.3
Total	33	100.0

followed by C6- C7 instability where skeletal traction was effective in 62.5% (n=5) of patients. It was not effective at all in individuals with atlantoaxial and craniovertebral instability and C3- C4 subluxation (n=1). There was 33.3% success rate in each of C2- C3 (n=1) and C4- C5 level (n=1) injury.

The frequency of radiological improvement was maximum (100%, n=9) in patients with posterior subluxation of cervical spine but minimum (0%) in patients with vertebral collapse associated with fragmentation and retropulsion. Satisfactory alignment was gained in 64.3% (n=9) of patients with anterior subluxation and half of patients (n=2) with bilateral facet dislocation.

## DISCUSSION

Skeletal cervical traction with Gardner-wells tongs is an easy way of reducing cervical subluxation or dislocation and then maintaining it by providing immobilization to the cervical spine. It gives longitudinal pull along the cervical spine that reduces deformity and restores normal anatomic alignment. It is the surest way of stabilizing an unstable fracture or fracture dislocation, or occasionally of releasing

locked facets. In fracture dislocation, it draws the fragments of the spine apart, restores the diameter of cervical canal, and reduces the danger of pressure on cord.<sup>4</sup>

By reducing subluxation and fracture dislocation, it releases root or cord compression and then by providing immobilization to the unstable spine, it helps in neurological recovery of injured cord. It gives time for cord edema to subside and cord contusion and hematoma to resolve. That is why skeletal cervical traction which is long being used is still preferable choice for initial management of unstable cervical spine injuries. It can also be used as definitive treatment in selected patients.<sup>3,4</sup>

Every year about 50 to 60 patients with stable or unstable cervical spine injuries present to our department who need admission and management on emergency basis. Out of 52 patients presenting to our unit in the last one year from December 2010 to November 2011, cervical traction was applied in 37 patients but just 33 patients met the inclusion and exclusion criteria of our study. Majority of our patients were males and young active energetic of 40

years or less which is in consistence with published literature.<sup>2</sup> The common mode of injury was fall from height followed by road traffic accident which is in contrary to Nikunj D et al<sup>2</sup> where 80% of the patients were having history of RTA. This contrast is probably due to the fact that a large part of our study population (30.3%) belonged to hilly areas where fall from mountains was usual history. Similarly, 42.4% of our patients were resident of central districts like Peshawar, Mardan, Charsadda etc.

Different studies have given different frequencies of improvement in anatomical alignment after skeletal cervical traction. For example, studies conducted by Maiman D et al,<sup>12</sup> Hadley MN et al<sup>13</sup> and Sonntag VKH<sup>14</sup> showed 55.5%, 58% and 66.7% radiological improvement which are quite consistent with our study where overall radiological improvement is 60.6% because the minor difference is not statistically significant. In all these studies, average weight used for traction was about 30- 40lbs which was very close to our series where recorded average weight used for successful reduction was about 35lbs. However, there was difference in the time required for obtaining radiological alignment. In the study of Hadley N et al<sup>13</sup>, the average time of reduction was about 5- 8 hours while in our study, the usual time of reduction was more than 24 hours most probably due to the care that we were taking in increasing weight while starting from very low weight and limited availability of portable X-ray machine. This problem can be overcome to some extent by round the clock availability of monitoring system to achieve early reduction.

In the study of Sonntag VKH<sup>14</sup>, reduction failed in 5 patients. One patient was having C1 fracture and 2 were having facet dislocation. This is quite similar to our results where traction for upper spinal injuries is not a favorable choice and the success rate of cervical traction

for facet dislocation is 50%.

In contrast to our study, the frequency of overall radiological improvement in the study conducted by Vital J et al<sup>11</sup> is very low (43%). The reason behind this lag may be the short time (less than 2 hours) given for traction. Beyond this time, they have used the method of manipulation under anesthesia for reduction which is nowadays considered an unfavorable technique except in selected cases due to potential risk of spinal cord damage.<sup>11</sup>

The series of Lee A, et al<sup>15</sup> has given overall improvement of 88% which is quite higher than that of our study. The exact reason for this discrepancy may not be explained. However, his sample size was comparatively very large (210 patient). He used upto 150lbs of weight for traction and his follow up was possibly long.

So the results of our study are comparable to many international series in spite of study limitation like small sample size. This indicates the efficacy and safety of skeletal cervical traction for unstable cervical spine injuries in terms of improvement in anatomical alignment.

## CONCLUSION

Skeletal cervical traction is safe and effective means of early decompression of spinal cord and establishing and maintaining alignment of cervical spine by close reduction. It is more effective in those with subaxial spinal instability particularly C5-C6 level due to extension type of injury.

It can be used safely for temporary stabilization of cervical spine.

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## AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

- RA:** Conception and design, acquisition of data, drafting the manuscript, final approval of the version to be published
- MA, SA:** Acquisition of data, critical revision, final approval of the version to be published
- MU, MH RH:** acquisition, analysis and interpretation of data; final approval of the version to be published

## CONFLICT OF INTEREST

Author declares no conflict of interest

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