

Impact of morphine use in reducing the need for CT scan in patients with cervical spine trauma: a double blinded randomized clinical trial

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Abstract

Background: Cervical spine trauma occurs mostly among young males due to falls and car accidents. The CT scan technology is replacing radiography in many medical clinics as it is very capable in detecting subtle cervical spine injuries. However, the use of CT scan for routine screening in patients with cervical spine trauma remains controversial due to its radiation risks and relatively high cost.

Objective: The focus of this research was on using morphine in patients with cervical spine trauma. The objective was to determine the ability of morphine to reduce the number of patients in need of CT scans.

Methods: This double-blinded randomized clinical trial study was conducted from April 2014 to March 2015 in Hasheminejad Hospital in Mashhad, Iran. We enrolled 67 patients with cervical spine trauma and normal radiography in the study. They were divided randomly into two groups (groups A and B), where group A received intravenous morphine, and group B received a placebo. We measured the pain scores in both groups before giving the medication and 10 minutes afterwards using a visual analog scale (VAS).

Results: As a result of receiving morphine, the patients in group A had significantly lower pain than group B (p-value < 0.001). The average pain score in group A was reduced by 43% versus 23% in group B. However, the most pain reduction was in those in group A with a normal CT scan. The pain score of these patients dropped by 52%.

Conclusions: The findings of this study suggest that patients with a normal radiography may be discharged with a cervical collar without a need for a CT scan if morphine reduces their pain. This is because the pain in these patients stem from the muscles and non-bony structures in the cervical spine area.

Clinical trial registration: The trial was registered at the Iranian Registry of Clinical Trials (<http://www.irct.ir>) with the IRCT ID: IRCT2013100214872N1

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1. Introduction

Cervical spine vertebrae support the skull and enable neck and head movement. Injuries to the cervical spine occur with a wide range of severity among youth and older people. In a study conducted on patients undergoing cervical spine radiography, Lowery and his colleagues reported that cervical spine injury is more common among elderly people and males (1). Hu et al. also surveyed over 2000 patients with spinal column injuries from 1981 to 1984 in Manitoba, Canada (2). Their findings showed that the injury rates were higher for young males and elderly females, mainly as a result of accidental falls and vehicle accidents. An appropriate treatment of cervical spine injury is very important for reducing the risks of paralysis and death. The current protocols for the evaluation of suspected injuries to the cervical spine include the history, clinical examination, and radiographic evaluation. These approaches are intended to identify presence of any instability or neurological deficits. This information is used to determine the need for and the extent of any intervention (3). Computed Tomography (CT) scan technology is used extensively, and it has essentially supplanted the role of traditional radiography. The ability of a CT scan to detect subtle injuries is superior to that of radiography (4). The advantages of this technique are especially apparent in the evaluation of the regions that cannot be visualized acceptably by plain films. These regions include the occipitocervical region, the facets/lamina, and the cervicothoracic junction (3). However, the use of CT scans for routine screening in cervical spine trauma is still controversial due to its radiation risks and relatively high cost. Morphine is an opioid analgesic drug that is used extensively in clinical medicine to manage severe pain. A study by Farsi et al. showed a significant reduction in pain after giving patients who had cervical spine trauma intravenous morphine at 0.15 mg/kg (5). The general objective of this research was to study the impact of morphine usage in patients with cervical spine injuries. The specific objective was to determine whether using morphine can help reduce the number of people in need for a CT scan and therefore lower the associated costs and radiation risks.

2. Material and methods

2.1. Trial Design

This study was a double blinded and randomized clinical trial that was conducted from April 2014 to March 2015 at the Hasheminejad Hospital in Mashhad, Iran.

2.2. Participants and selection criteria

First, we evaluated all patients admitted to the hospital with cervical spine trauma. As a result, we enrolled 67 patients with a normal X-rays but had pain in the cervical vertebrae. Patients with the following conditions were excluded from this study:

- 1) History of fracture of the cervical spine
- 2) Unstable hemodynamics
- 3) Altered mental status
- 4) Focal neurologic deficit
- 5) Pain disorder disease
- 6) Intoxication
- 7) History of orthopedic and rheumatologic disease
- 8) Malingering
- 9) Contraindication of morphine use (such as asthma)
- 10) Patients with no pathologic findings

2.3. Randomization

The participants were divided in a random order without their knowledge into two groups, i.e., groups A and B with 33 and 34 patients, respectively. Neither gender nor age influenced the randomization process.

2.4. Interventions

Group A received intravenous morphine at 0.1 mg/kg, while the group B received only a placebo. CT scans also were performed for the members of both groups. We divided each group into normal and abnormal categories based on the results of the CT scans.

2.5. Blinding

This study was conducted in a double-blinded manner. Neither the patients nor the drug administrators were aware of the type of medication, and only one of the researchers knew the drug code labeled for the two groups.

2.6. Outcomes

The main outcome was that the pain scores were measured using a visual analog scale (VAS), which is an instrument for measuring subjective characteristics, such as pain, that cannot be quantified directly. Sharifi and colleagues (6) used VAS to measure pain in patients with scaphoid bone fractures. In VAS, the patients specify their level of pain by indicating a position along a continuous line between two end-points (7). We measured the pain in patients before given medication and 10 minutes afterwards.

2.7. Statistical methods

The statistical analysis of the data was done using IBM SPSS Statistics software. The variables in this analysis were age, gender, type of medication, and the results of the CT scans. We used the Receiver Operating Characteristic (ROC) to process the quantitative data, and we used the chi-squared test for the analysis of the qualitative data. The level of significance, P-value, was set to 0.05.

2.8. Research ethics

All patients signed an informed consent form. In addition, the study was approved by the Ethics Committee at Mashhad University of Medical Sciences.

3. Results and discussion

Group A was composed of 20 men and 13 women, and group B had 24 men and 10 women. The average age in the two groups was almost identical at 37. However, those in group B had a larger variation in their ages; the standard deviation was 23.1, while it was 13.93 in Group A. The results of the CT scans are shown in Table 1. Overall, 82.1% of the patients had normal CT scans, while 17.9% had abnormal results. This table also shows that there were six abnormal cases in each group. Table 2 compares the pain scores for the two groups before and after using medication.

Table 1. Results of the CT scans

Variable	Group A		Group B		Total	
	n	%	n	%	n	%
Normal CT scan	27	81.8	28	82.4	55	82.1
Abnormal CT scan	6	18.2	6	17.6	12	17.9
Total	33	100	34	100	67	100

Table 2. Pain score before and after using medication

Variable	Group A (Morphine)			Group B (Placebo)		
	Normal CT scan	Abnormal CT scan	Group average	Normal CT scan	Abnormal CT scan	Group average
Pain Score before medication	7.33 ± 1.07	8.33 ± 1.21	7.5 ± 1.14	6.96 ± 1.37	8.66 ± 1.21	7.2 ± 1.5
Pain score after medication	3.51 ± 0.93	7.83 ± 0.98	4.3 ± 1.9	5.03 ± 1.4	8.16 ± 1.47	5.58 ± 1.84
p-value	< 0.001			< 0.001		

The t-test results showed that there was a significant statistical difference in the change in the pain scores between the two groups (p-value < 0.001). The average pain score in group A (those who received intravenous morphine) was reduced by 43% (down from 7.5 to 4.3), while the average pain score of group B dropped only by 23% (down from 7.2 to 5.58) after receiving placebo. The patients with a normal CT scan in group A had the most reduction in average pain score, i.e., from 7.33 to 3.51 (a 52% decrease). This suggested that the pain in these patients may come from the paravertebral muscles or other cervical non-bony structures. Cervical spine trauma often occurs due to falls and car accidents. Some studies, including this one, have shown that this type of injury is more common among young males (1, 2). An appropriate treatment of this trauma is important in reducing the risks of paralysis and death. In treating patients with moderate to high-risk cervical spine trauma, the CT scan technology can be highly effective due to its ability to detect subtle injuries (4). However, it is somewhat expensive relative to the plain X-ray. Morphine is used extensively in medicine to manage severe pain. The focus of this study was on the impact of the use of morphine on patients with cervical spine trauma. Our objective was to determine whether the need for CT scan in these patients could be reduced. Sixty-seven participants with cervical spine trauma and normal x-rays were

divided into two groups, i.e., group A and group B. Group A received intravenous morphine at 0.1 mg/kg, while group B received only a placebo. We recorded their pain scores using a visual analog scale before and after administering medication. The findings showed a much larger reduction in pain in group A than in group B (p-value < 0.001). Using morphine in group A led to 43% reduction in average pain score, which was significantly greater than the 23% decrease observed in group B (5). Those with a normal CT scans in group A had the most reduction in pain score, i.e., 52%.

4. Conclusions

The results of this study suggested that cervical spine patients with a normal X-ray may be discharged from hospital with a cervical collar on the condition that morphine reduces their pain. They don't need a CT scan because their pain stems from muscles and the non-bony structures in the cervical spine area. There were some limitations in our study since factors such as age, gender, and the severity of the cervical spine trauma were not included. The other limiting factor was the small number of participants. Further research with more participants is needed to confirm our findings.

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Clinical trial registration:

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Conflict of Interest:

There is no conflict of interest to be declared.

Authors' contributions:

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

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