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Original Article

Reasons for delayed spinal cord decompression in individuals with traumatic spinal cord injuries in Iran: A qualitative study from the perspective of neurosurgeons

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ABSTRACT

Purpose: The median time from the event leading to the spinal cord injury (SCI) to the time of decompressive surgery is estimated to be 6.9 days in Iran, which is much longer than the proposed ideal time (less than 24 h) in published guidelines. The current qualitative study aimed to determine the reasons for the observed decompression surgery delay in Iran from the perspective of neurosurgeons.

Methods: This qualitative study is designed to perform content analysis on the gathered data from face-to-face semi-structured interviews with 12 Iranian neurosurgeons.

Results: The findings of the current study suggest that patient-related factors constitute more than half of the codes extracted from the interviews. Overall, the type of injury, presence of polytrauma, and surgeons' wrong attitude are the main factors causing delayed spinal cord decompression in Iranian patients from the perspective of neurosurgeons. Other notable factors include delay in transferring patients to the trauma center, delay in availability of necessary equipment, and scarce medical personnel.

Conclusion: In the perspective of neurosurgeons, the type of injury, presence of polytrauma, and surgeons' wrong attitude are the leading reasons for delayed decompressive surgery of individuals with SCI in Iran.

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Introduction

Spinal cord injury (SCI) is a catastrophic condition that can lead to long-term and permanent disability, resulting in financial costs for both patients and the health care system.¹ The gravity of this

public health problem has led to multidisciplinary research and initiatives in Iran, including the designation of a national SCI registry, i.e. National Spinal Cord Injury Registry of Iran (NSCIR-IR) to better understand SCI management in Iran.² Global evidence suggests that timing is crucial in the neurologic prognosis of individuals with SCI,^{3,4} and advises that surgical decompression should be performed in less than 24 h^{5,6} or less than 8 h, if possible.^{3,7} Iranian national studies as well as international studies suggest that early surgical decompression (in less than 24 h) shortens length of hospital stay and improves outcomes in

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individuals with SCI.^{8–11} However, NSCIR-IR data indicate that the median time from the traumatic event to the operating room is estimated to be 6.9 days in Iran (interquartile range not specified).² The current study intends to identify the reasons, from the perspective of Iranian neurosurgeons, for delay of surgical decompression in individuals with traumatic SCI in Iran using semi-structured interviews as a qualitative deductive method.

Methods

Study methods were designed based on the qualitative content analysis method, a technique to decontextualize text to codes and categories to achieve meaningful inferences.^{12,13} The rationale for choosing this method was to recognize the most possible factors responsible for the decompression surgery delay to guide the next studies in higher hierarchies. Although the themes of this study were pre-determined to be healthcare system-related, patient-related, and surgeon-related, interviews were based on encounter context themes (ECT) methodological device¹⁴ to build a two-way road of knowledge and experience between researcher and participant and avoid the mechanistic inference of meanings from the participants' experience regarding the study questions. This study was performed at four Iranian governmental hospitals in three cities (Tehran, Tabriz, and Rasht) that the NSCIR-IR endorses. Regarding NSCIR-IR-linked hospital distribution, the primary sampling strategy involved the non-probability convenience method, as reaching out to all participants with the same effort would be prohibitively difficult and time-consuming. Snow-ball strategy accompanied the convenience method, and previous participants recruited some eligible participants. Participants (Table 1) fulfilled the following criteria for inclusion in the present study; neurosurgeons working in a government-sponsored hospital that collaborates with the NSCIR-IR, had at least five years of SCI management experience. Interviews were conducted using a questionnaire and guideline document (Appendix 1). Data saturation occurred following 12 interviews; no new code or novel themes were being articulated at this point. Two researchers were responsible for conducting interviews. They recorded the interviews, transcribed them to text anonymously, and built a document for each interview. The analyzers received these documents, randomized them, coded the data manually, and assigned the codes to the pre-determined themes. An example of the process is shown in Table 2. Two different researchers performed this process independently. This paper examines the reasons for delay in spinal cord decompressive surgery from neurosurgeons' subjective perspective, and therefore best fits the interpretivism paradigm. This study is reported using the Standards for Reporting Qualitative Research guideline.¹⁵

Results

Analysis of data by analyzers demonstrated a Cohen's kappa coefficient of 0.84. Articulated codes and their frequencies are shown in Table 3. As these results suggest, in Iran, neurosurgeons believe that patient-related factors are the most frequent reasons for spinal cord decompressive surgery delay in individuals with SCI. About 57% of the codes extracted from interviews fell within the patient theme. Roughly half of the codes belonging to the patient theme were constituted from one single code: type of SCI in each patient (e.g. complete and incomplete SCI). The second most common code involved co-existence with polytrauma. Other less frequent codes of this theme included patient socioeconomic status, patient consent for early surgery, past medical history, and the use of drugs or medications that resulted in postponement of surgery. The healthcare system-related theme was the next most common theme (30%). The most emphasized codes in this theme

Table 1
Demographic data of participants.

Participants	Age (years)	Years of experience
1	36	5
2	48	14
3	43	9
4	59	25
5	52	21
6	47	15
7	35	5
8	49	18
9	50	17
10	39	6
11	43	10
12	56	25

were delay in transfer to a trauma center capable of conducting decompressive surgery, delayed preparation of required equipment for surgery, and unavailability of personnel. Delay in other departmental services (e.g. general surgery and internal medicine) and scarce diagnostic and treatment equipment were the least frequent codes of the healthcare system-related theme. Finally, 12.5% of codes belonged to the surgeon theme, which predominantly consisted of surgeons' wrong attitude (10%). Nearly all of the participating neurosurgeons were familiar with the latest guidelines, and only one code (2.5%) was attributed to the surgeon's inadequate knowledge of surgical timing. Overall, the most frequent codes extracted from interviews were type of injury (27.5%), presence of polytrauma (15%), and surgeons' wrong attitude (10%), each belonging to the patient, healthcare system, and surgeon themes, respectively.

Discussion

In a study performed in China, Zhu et al.¹⁶ showed that early neurosurgical interventions combined with rehabilitation in patients with complete SCI improve motor outcomes. Although it did not analyze SCI, a separate prospective observational study conducted in China, Africa, India, South Asia, East Asia, and Latin America proposed that delayed hospital admission is the most important reason for delayed orthopedic fracture management in low- and middle-income countries.¹⁷ As demonstrated by a retrospective analysis accompanied by a surgeon survey in Canada,¹⁸ most neurosurgeons recognize that the ideal time frame to perform decompressive surgery after traumatic SCI (TSCI) is within 24 h of injury. Despite these findings, a substantial number of patients with TSCI still receive operative management outside of the initial 24 h period. The authors of this study concluded that there is a need for strategies to increase knowledge translation and decrease administrative barriers Furlan et al.¹⁹ proposed that in Canada, healthcare system-related factors are more prominent than patient-related factors in wait time for decompressive surgery following SCI. Healthcare system-related factors are likely essential contributors to decompressive surgery delay in Iran, especially considering our study's context, which was conducted in a developing country under economic sanctions. However, healthcare system-related factors are less critical than patient-related factors in determining decompressive surgery timing from the perspective of Iranian neurosurgeons.

Iranian neurosurgeons mainly indicated that the type of injury is the underlying reason for the reported delay. They frequently mentioned that individuals suffering from complete SCI do not benefit from early decompressive surgery, and that it is reasonable to postpone surgery until the patient's clinical status is stabilized and other possible injuries are discovered. Individuals with incomplete SCI might experience clinical improvement after early

Table 2
Example of code extraction process.

Transcribed phrase	Summarized phrase	Code	Allocated theme ²¹
Patients differ from each other, both in their intrinsic factors and their suffered injuries. The most important factor determining my surgery timing decision is whether the spinal cord injury is complete or incomplete. I perform the surgery as soon as possible if the injury is incomplete.	I perform early surgery on incomplete cases of spinal cord injury	Type of injury	Patient injury

Table 3
Extracted codes and their frequencies.

Theme	Frequency of the themes (%)	Codes	Frequency of the codes (%)	Repetition times of the codes
Patient	57.5	Type of injury	27.5	11
		Presence of polytrauma	15.0	6
		Socio-economic status	5.0	2
		Consent for surgery	5.0	2
		Past medical history	2.5	1
		Drug and medication history	2.5	1
Health care system	30.0	Delay in transferring patients to the trauma center	7.5	3
		Delay in the availability of the necessary equipment	7.5	3
		Scarce medical personnel (e.g. surgeon, anesthesiologist, operating room staff)	7.5	3
		Delay in services of other departments (e.g. general surgery, internal medicine)	5.0	2
		Scarce diagnostic and treatment equipment	2.5	1
Surgeon	12.5	Surgeons' wrong attitude	10	4
		Surgeons' inadequate knowledge of surgery timing	2.5	1

decompressive surgery, and neurosurgeons therefore generally perform decompressive surgery for incomplete SCI as quickly as possible. Interestingly, this finding is similar to the results of another study in the Netherlands.²⁰ We hope that these findings compel the NSCIR-IR to re-calculate the mean time from injury to decompressive surgery depending on the type of SCI. It could be possible that after this re-calculation, healthcare system-related factors get more attention and play a more distinct part in decompression surgery delays in Iran, just as they did in the mentioned study in Canada.¹⁸

Polytrauma was also found to be a key determinant of decompressive surgery timing in our study. The presence of polytrauma complicates the decision-making process for early decompressive surgery because it leads to the involvement of other medical services in patient management. For instance, patients with cardiac tamponade in addition to SCI must be stabilized prior to spinal cord decompressive surgery.

National policies and regulations also compel hospitals to manage individuals suffering from injuries secondary to road traffic crashes free-of-charge. Despite these policies, studies show that individuals suffering from TSCI as a result of road traffic accidents are still subject to costly expenses in Iran.⁸ Nevertheless, our study's findings suggest that patients' socioeconomic status does not influence the decision-making process from neurosurgeons' perspective. This finding might be related to more effective implementation of the aforementioned national policies than six years ago, when the referred study was conducted.

Delay in healthcare system function was generally attributed to delayed patient and surgery equipment transfer. Interviewed neurosurgeons indicated that patients in rural areas sometimes rely on their own family or acquaintances for hospital transportation, contributing to additional delay in patient arrival to a trauma center. Patients in urban areas are usually transferred in a timely fashion, and their arrival time does not typically play a substantial role in surgical timing. Overall, interviewed surgeons in the current study do not believe that delayed hospitalization (composed of

patient transfer time and hospital admission delay) plays a crucial role in delayed surgical interventions of patients with SCI in Iran. This is contrary to findings of Pouramin et al.¹⁷ in some other low- and middle-income countries and can be attributed to the better function of pre-hospital emergency medical services in Iran. Surgical preparation requires coordination between hospitals and medical equipment companies, and in Iran it is common to encounter delay in equipment delivery by companies. Scarce medical personnel is often not due to a lack of human resources, but rather because other medical services, such as anesthesiology and operating room staff, do not recognize the SCI as a medical emergency and do not prioritize SCI patients. SCI patients with polytrauma must be assessed and treated by other surgical services before decompressive surgery, and in some neurosurgeons' opinion, this delay may beget delay in spinal decompression. This delay is most likely not a defect but is part of their work's nature.

Similar to the study mentioned above,¹⁸ nearly all of the interviewed neurosurgeons were familiar with the latest evidence regarding time to surgical decompression, and nearly all surgeons mentioned that it is in the best benefit of the individuals with SCI to undergo decompressive surgery within 24 h. Our results demonstrate that neurosurgeons' knowledge should not be counted as a factor leading to delay in decompressive surgery. However, one of the most frequently encountered codes was the wrong attitude of the surgeons. This code is assigned to phrases that imply that surgeons' decisions regarding surgical timing are not made based on scientific evidence but rather considering the surgeon's benefit. It is reasonable to conclude that Iranian surgeons consider operating on an individual with SCI is not cost-effective, and the surgeon can spend his or her time performing other surgeries which he or she thinks would be more cost-effective. This wrong attitude does not consider the patients' best benefit and should be corrected.

Finally, Alice Eagly and Shelly Chaiken defined attitude as a psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor in their remarkable

text *Psychology of Attitude*. Attitudes shape the behavioral intention, finally resulting in certain behaviors. The authors of this study suggest that required steps must be undertaken to change the wrong attitudes of surgeons regarding the decompression surgery timing, as one of the most critical factors leading to decompression surgery delay in Iran. These steps could include holding workshops and conferences for surgeons emphasizing the importance of early surgical decompression in individuals with SCI, preparing feedbacks and evaluations by the healthcare system informing each surgeon regarding the decompression surgery timing of him/her. Implementing regulations and laws compelling surgeons to perform decompression surgery in a timely fashion might also be beneficial in changing surgeons' attitudes and behavior.

Limitations of the study

A qualitative study might lack of generalizability. This study was only performed in some NSCIR-IR-linked government hospitals without any sampling from private hospitals, and therefore may not be generalizable to other settings. Additionally, this study's qualitative design was based on the intention to identify the possible reasons for decompressive surgery delay in Iran, and subsequent quantitative studies should validate our findings. In addition, our sample size remained in 12 samples due to data saturation occurrence. This might be considered as a low sample size and a limitation of the current study as well.

Conclusion

Knowledge translation efforts and approaches to optimize medical systems are required to facilitate higher rates of early surgical intervention. Our results, generated in Iran, are representative of developing countries, which comprise almost half of the world. According to Iranian neurosurgeons, patient-related factors, such as type of injury and presence of polytrauma, are the leading reasons for delayed decompressive surgery for SCI. Other important reasons include healthcare system-related factors, such as delayed patient transfer to a trauma center, and surgeon-related factors such as improper attitude. Finally, neurosurgeons' understanding of the decompressive surgery timing is compatible with the latest evidence, and should not be assumed as a factor contributing to delayed decompressive surgery.

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Ethical statement

The Ethics Committee of Tehran University of Medical Sciences approved this study and the reference number is IR.TUMS.MEDICINE.REC.1398.731. Participants of this study permitted the recording, transcription and analysis of the interviews.

Declaration of competing interest

The authors declare no competing interest.

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