

Brief Report

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Life-saving Field Amputation During the 2023 Türkiye Earthquake: Ethical, Social, and Legal Implications Beyond the Complex Medical and Rescue Procedures in the Rubble

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Abstract

Amputation as a life-saving measure for earthquake-trapped patients is supported by WHO and INSARAG guidelines. However, implementing these guidelines in highly stressful contexts can complicate decision-making. This report presents a case of life-saving amputation during the 2023 Turkey earthquake, adhering to recommended guidelines. The 16-year-old patient was trapped for 55 hours in a narrow corridor. Extensive interdisciplinary discussions led to the decision for a field amputation after alternative rescue attempts failed. Consent was obtained from the family, given the patient's delirium. Meticulous planning and anesthesia using midazolam and ketamine ensured successful amputation with minimal blood loss. Challenges encountered during the disaster response were discussed. Delays in administering antibiotics, a lack of cervical protection, ethical dilemmas, psychological concerns, and legal implications were highlighted. Continued improvement and addressing ethical, legal, and psychological aspects are essential for optimal disaster response outcomes.

Amputation as a life-saving measure for patients trapped in earthquake rubble is well-documented in the medical literature and endorsed by World Health Organization (WHO) and International Search and Rescue Advisory Group (INSARAG) guidelines.^{1,2}

The application of these guidelines may appear straightforward when needed, but it is vital to recognize that such situations arise in highly stressful contexts, which can complicate the decision-making process.^{3,4} This report details a life-saving amputation performed on a patient trapped for 55 hours after the 2023 Turkey earthquake. Adherence to guidelines was strict, highlighting encountered challenges and proposing solutions for impractical aspects within our context.

Case Report

Thirty-eight hours after the earthquake (HAEQ), the Swiss Urban Search and Rescue (USAR) team began rescue operations at a site where local helpers had created 2 openings through armed concrete to access the fourth floor from the roof. Vocal contact with the 16-year-old trapped boy was established, but visual contact was not made until 8 hours later at 46 HAEQ. Physical contact was achieved 2 more hours later at 48 HAEQ. The boy was found lying in a narrow, inclined corridor measuring 50 x 80 cm and 250 cm long, with his head facing downward, resting on his deceased mother's leg.

The boy's right arm was entrapped at the above-elbow level under a nonremovable concrete wall, and, due to this entrapment, the distal three-quarters of his arm were necrotic after being trapped for more than 50 hours. He was in a state of delirium and dehydration but clinically stable.

After extensive interdisciplinary discussions involving the medical team, technical rescue team, and static engineer, it was concluded that a field amputation was the only viable option to save the patient's life.

As a last resort, the medical team leader suggested that the rescuers attempt to dig a second access tunnel to reach the patient from an alternative route. Despite several hours of diligent efforts, this option proved unsuccessful, leading to the decision to proceed with the amputation at 52 HAEQ. The entire medical team unanimously reached a collegial consensus on this strategy, which was further reinforced by seeking a second medical opinion from the head medical team at headquarters in Switzerland. However, attempts to reach local representatives (administrative or religious) authorities were unsuccessful.

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Once the medical rescue team reached a collective decision, they engaged in discussions with the victim's father and family to obtain their consent for the necessary surgical procedure and their full cooperation. During the initial discussion, the family was given clear information about the need for amputation to save the boy's life and the unfortunate death of the person trapped next to him. As part of the communication, it was suggested that the child's father should personally visit the rubble site to witness the situation and talk to his son directly. After that, he wholeheartedly provided his complete consent and support for the procedure. It is crucial to emphasize that, apart from the language barrier, the patient's condition was characterized by fluctuating consciousness, delirium, and strong resistance to any attempts at approach, making it impossible to obtain his consent.

The medical and rescue teams meticulously planned each step of the procedure, considering alternative options for every part of the plan. A local ambulance was organized, and the target hospital was determined. Complete anesthesia was achieved by administering midazolam and ketamine to the patient. Given the high level of arm entrapment and lack of space for a tourniquet or sterile Gigli amputation saw, a guillotine amputation was performed at the anatomical subcapital level using a classic amputation knife and the non-sterile saber saw from the rescue team. The entire amputation process lasted 3 minutes, surprisingly resulting in minimal blood loss, allowing for a more cautious extraction process that took 9 minutes.

Upon reaching the building's rooftop, the patient was placed on a spine board, and the wound was cleaned and disinfected. Ligation of the axillary vein was performed, but locating the artery proved difficult due to its reflexive retraction. However, there was no active bleeding, and we applied a pressure dressing. Successfully, the patient was transported, together with his father, to the trauma hospital in Adana at 56 HAEQ. On the fifth day after the amputation, we visited the patient at the hospital and found him to be in good clinical and psychological condition.

Discussion

Despite the successful procedure and positive patient outcome, the debriefing highlighted several significant concerns that warrant discussion within the challenging and traumatic context of the earthquake in Turkey. The fatigue and emotional toll experienced by the USAR teams undoubtedly impacted their performance, underscoring the importance of continuous support and training in various crucial aspects of earthquake medical management. Enhancing resilience and decision-making in high-stress situations should be a key focus of ongoing efforts.^{3,4}

Firstly, there was a delay in administering antibiotics, which occurred several hours after the optimal time frame. In the context of disasters, the majority of crush wounds are contaminated and often infected, and antibiotic prophylaxis is recommended, although there is no consensus on the injection interval.⁵ However, in this case, no wound infection was documented in the patient.

Secondly, the urgent decision to extract the patient rapidly from the rubble led to a lack of adequate cervical protection measures. The decision to rapidly extract the patient without implementing specific spinal cord protection measures was made based on the confirmed incarceration dynamics observed during the patient's clinical assessment. Although the use of cervical collars to minimize the risk of secondary injuries from unstable cervical fractures is

common practice in trauma cases, a thorough clinical assessment can help avoid unnecessary use of cervical collars. Interestingly, we unknowingly adhered to the recommendations of the newly suggested management protocol for cervical immobilization in earthquake situations, even before its publication.⁶

Thirdly, the decision to pursue an alternative tunnel caused a significant time loss that could have further impacted the patient's condition. Upon reflection, one may question the ethical wisdom of investing time in digging a second tunnel amid a chaotic disaster, where the demand for attending to other victims was enormous and hinged on the prompt response of USAR teams.⁷ This clearly underscores the dramatic nature of the amputation, and ultimately, for the decision-makers, the ethical balance in this particular case leaned in favor of the patient known to the USAR team, as opposed to the thousands of other unidentified victims.⁸ Even when earnestly considering ethical guidelines during a disaster, it is not always easy to interpret and apply them within the confines of a tunnel of rubble.^{9,10}

Fourthly, on a psychological and social level, despite receiving warm thanks, the family expressed concerns and questions about whether there could have been alternative approaches and the whereabouts of the amputated limb. Although it is quite human and understandable, we were taken aback by these remarks, considering that the victim's family was actively involved in the decision-making process with the aid of a translator, ensuring that they received the most honest, comprehensible, and complete information. Beyond obtaining consent, our intention was also to provide support in preparing for the bereavement process, as it encompassed not only the loss of the victim's mother, who was trapped alongside him, but also the profound impact of the life-saving amputation resulting in the loss of his arm. Despite diligently applying guidelines, providing clear and honest information, involving the family in decision-making, and taking steps to initiate the mourning process, the urgency and emotional intensity of the situation can impede a clear conceptualization of the long-term consequences associated with such a challenging surgical decision.^{11,12} Little is known about the relationship between the initial medical management of patients and families in situations involving life-saving amputations and cadaver extractions and the occurrence of post-traumatic stress disorder and long-term grief.^{13,14} Therefore, in the absence of an acute mental support professional, benevolence and empathy remain the USAR team's only tools in this context.

Fifthly, the legal and ethical implications of amputating a child's limb in this context require further clarification. While our patient's outcome was positive, it raises questions about potential repercussions if the results had been different. What if the child develops a post-traumatic syndrome, faces social exclusion due to disability, or experiences chronic pain in the future? While the Good Samaritan law or duty of rescue law may apply in many disaster situations, it becomes crucial to explicitly address this matter for every USAR deployment where life-saving mutilating surgery may be performed.^{9,15}

Sixthly, no prospect of rehabilitative care was envisaged in this case, either with the Turkish health authorities or with a hospital specializing in the disabled, essentially because in the emergency of the disaster, the USAR team's objective was to save as many lives as possible.¹⁶

In summary, a successful amputation procedure was performed on a 16-year-old individual who was trapped in the debris. The execution closely followed the guidelines outlined by INSARAG

and WHO. Despite proficient surgical and anesthetic techniques, along with a successful rescue, yielding positive outcomes for the patient, it is not uncommon for practical applications, especially in disaster situations, to encounter oversights, errors, and unanticipated challenges. It is plausible that through experience and repeated encounters, the implementation of recommendations will improve across all scenarios. Nonetheless, certain aspects, particularly pertaining to ethical and legal considerations, warrant further clarification and examination.

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All authors contributed to the patient's care or the ensuing discussion. All authors contributed to the development of the ideas and opinions expressed in the manuscript.

Use of Artificial Intelligence (AI) Tools. Chat GPT (GPT-3.5) was used for translating from French to English and for editing the manuscript.

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