

LETTER TO THE EDITOR

Curative Effect of Single Arm Hinged External Fixation in the Treatment of Unstable Ankle Joint Fracture Dislocation of Soccer Players Based on Environmental Science

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Method: A total of 180 soccer players who has been confirmed with unstable ankle joint fracture dislocation were selected as the objects of study. They were subjected to single arm hinged external fixation combined with limited internal fixation. Mayo scoring criteria were used to assess the elbow function from various aspects (pain, range of motion, stability, etc.), and the quality of life of the patient was recorded after treatment. Results: After the patients received treatment, the overall treatment excellent rate was 92.22%, Mayo score was 82.9 ± 11.3 points, averaged range of motion of elbow was (106.9 ± 20.6) , showing good overall recovery status. Conclusion: The application of single arm hinged external fixation based on Environmental Science can achieve sound curative effect in the treatment of unstable ankle joint fracture dislocation of soccer players, resulting in improved overall treatment rate, reduced pain and better quality of life.

I Introduction

Chich Jen Shieh, Guang Sheng Wan, Wei Wang, Yuzhou Luo published "An Empirical Study on the Performance Evaluation of Introducing Artificial Intelligence Medical Service System into Medical Ecological Environment" on Issue: 107, Pages: 183-189, Article No: e107074, Year: 2019, in the article, An artificial intelligence medical service system might be the ideal tool to actualize local aging. The research results conclude that one DMU presents strong efficiency on the introduction of artificial intelligence medical service system into medical ecological environment, 6 DMUs reveal the efficiency in 0.9-1, and 9 DMUs appear the efficiency lower than 0.9. Slack Variable Analysis is further applied to improve excess and short inputs of prefecture-level cities. The ankle joint fracture (fracture of ankle to be) occurs commonly, no matter in daily life or on the playground. According to statistics, ankle fractures plus ankle ligament injuries account for 4-5% of total injuries (Wang et al. 2015). Ankle fractures are often caused by indirect violence, such as valgus, varus, or pronation. Fractures of different types and degrees occur depending on the size, direction, and position of the foot at the time of injury. The ankle joint is a weight-bearing joint, and all the fractures are intra-articular fractures. If the alignment is not good, traumatic ankle arthritis will be formed, causing stiff ankle pain, difficulty in walking, and great pain. Furthermore, most of these injuries are the combined injuries of bone and ligament, which should be treated with equal attention. In normal training or matches, Soccer players are easy to have ankle fracture dislocation problems,

which is one of the groups with high incidence (Xu et al. 2015).

Unstable ankle joint fracture dislocation is mostly caused by indirect violence. Symptoms include severe pain in the ankle, swelling, and subcutaneous congestion. The routine physical examination will aggravate the pain, so the doctor should use gentle methods during the examination. After the wound has tenderness, the doctor will further use auxiliary examination to confirm the diagnosis (Reiner et al. 2018). This study investigates the curative effect of single arm hinged external fixation based on environmental science in the treatment of unstable ankle joint fracture dislocation of soccer players, with the purpose of providing valuable reference for clinical treatment (Chen et al. 2017).

II Perspective

180 soccer players who had been treated in our hospital for unstable ankle joint fracture and dislocation (as shown in figure 1 below) from June 2015 to June 2018 were selected as study objects. Patients and their family members had the right to know about this study, and they signed the formal informed consent. The research content was approved by the hospital ethics committee. Of the 180 patients, there were 124 males and 56 females, with an age range of 22 to 32 (27.0 ± 3.2) years old.



Fig 1. Examination image of the unstable ankle joint fracture dislocation

Open reduction and internal fixation of fracture and dislocation were carried out. Scientific and reasonable surgical approach based on environmental science was adopted to repair the damaged joint capsule and lateral collateral ligament by the nail plate system and internal fixation such as kirschner wire or steel wire. After that, the outer fixation bracket (the cross-joint hinged external fixator (ORTHOFIX) was installed. In the state of C-arm fluoroscopy, the lateral position of the ankle was placed, the kirschner wire was placed, and the outer fixator was inserted at the center needle (Ren et al. 2017). The incision was made in the corresponding part of the pinhole of external fixator, and the thread needle was separated to the bone surface. Screw the thread needle into the far and near part after drilling, and the external fixator was opened and tightened. It was advisable to control the ankle joint space at about 3 mm (Geri 2016). Carefully check the ankle activity and stability, and make sure there was no concentric reduction. Postoperative conventional detumescence and anti-infection treatment were carried out. Early rehabilitation exercises were performed, including loosening the knobs in the center of hinge brackets, ankle flexion and extension and rotation, and fully relaxing the fixation bolts of ankle joints (Bahadir et al. 2019). About 7 weeks after the operation, the external fixator was removed according to the actual condition of the patient and the environment. The patient was instructed to come back to the hospital for regular review to understand the recovery

status.

After the operation, patients were followed up for six months to one year to record the excellent rate of treatment. The pain, range of motion and stability of the joints were comprehensively evaluated using the Mayo scoring system. The total score is 100 points, and 90 points and above represent excellent results, 75-89 points for good results, 60-74 points for acceptable result, and under 60 points for poor result, respectively. At the same time, the mobility, stability and treatment satisfaction of the patients were evaluated. General Quality of Life Inventory (GOQL-74) was used to evaluate patients' quality of life.

SPSS21.0 statistical analysis software was adopted to process data. The measurement data were expressed by means of mean \pm average ($\pm s$), with t test conducted for intergroup comparison. The enumeration data were expressed in terms of natural number (n) and percentage (%), with X2 for intergroup comparison. The intergroup difference was considered of statistical value when $P < 0.05$.

As shown in table 1, the mean follow-up time was (8.3 \pm 0.9) months, and the overall excellent rate of treatment was 92.22%. The images of 1 patient before and after treatment are shown in figure 2 and figure 3 below.

Table 1. Statistics of excellent rate of treatment [n (%)]

Case number	Excellent	Good	Acceptable	Poor	Excellent rate of treatment (%)
180	129	37	8	6	166 (92.22)



Fig 2. Examination image before treatment



Fig 3. Examination image after treatment

As shown in table 2, the mean postoperative Mayo score was (82.9-11.3) points, the average range of motion was (106.9 + 20.6), and the score of treatment satisfaction was 168 (93.33), showing good overall recovery status.

Table 2. The postoperative Mayo score, range of motion, and treatment satisfaction

Group	Mayo score (point)	range of motion (°)	treatment satisfaction (%)
180	82.9±11.3	106.9±20.6	168 (93.33)

According to the statistics in table 3 below, the patients after the surgical treatment got ideal quality of life.

Table 3. Evaluation score of quality of life ($\bar{x} \pm s$)

Case number	Mental function	Social function	Physical function	Emotional life	Total score
180	80.80±6.45	80.19±9.04	80.25±7.23	79.05±8.38	80.25±7.03

III Personal View

In this study, patients were treated with an auxiliary fixation mode based on environmental science, and good results were obtained. During the treatment of this scheme, the patient did not accept the external fixation after surgery, and the joint exercise was carried out about 3 days after the operation, with more remarkable functional recovery effect being achieved. The hinged external fixator has the same activity axis as the ankle joint axis, which can open the joint space and fix the joint firmly. At the same time, standard frontal and lateral fluoroscopy should be performed in the C-arm state to ensure that the guide wire in the orthographic image passes parallel to the articular surface, so that the rotation center of the ankle joint is the same as the movable axis of the external fixator. In addition, the early postoperative passive activities can promote the fracture and the healing rate of ligaments, so as to reduce the disability caused by complex ankle fracture and dislocation (Kachaporn and Win 2017). In this study, the cross-joint external fixation scaffold produced by ORTHOFIX was adopted. In strict compliance with the requirements, the most important thing is to drill a kirschner needle (diameter of 2 mm) into the center of the pulley and determine the rotation axis of the joint of the external fixation stent, so that the patient can develop functional exercise as soon as possible. Moreover, the external fixator of the stent will not affect the bone and soft tissue structure of the elbow joint, and play a reliable protective role.

During the treatment of unstable ankle fracture dislocation, more attention should be paid to the restoration of the bone structure of the patient, the repair of ligaments to the maximum extent, and the scientific application of external fixation with the belt joint, so as to improve the prognosis. The single-arm hinged external fixator based on environmental science in the treatment of unstable ankle joint fracture dislocation can achieve better results. On the one hand, it can effectively restore the bone and soft tissue structure of the ankle; on the other hand, it allows early functional exercise to prevent the functional loss of the ankle.

IV Conclusion

In conclusion, unstable ankle joint fracture dislocation is relatively complex, and in some cases it is easy to combine with serious injury of other bone structure or soft tissue of elbow. Due to the large amount of sports training activities of soccer players at ordinary times, or the large amount of exercise during the game, they are easy to suffer unstable ankle joint fracture dislocation. Once this kind of disease forms, a big impact will be posed to normal quality of life and training. It is very important to adopt scientific and effective treatment in time to improve

the prognosis of patients. The method of single-arm hinged external fixation combined with limited internal fixation is applied to ensure the stability of the ankle joint, so that the bone structure and collateral ligaments of the ankle joint are not subjected to premature force and thus can be repaired. This combined fixation mode can achieve a good effect in the treatment of unstable ankle joint fracture and dislocation, which can significantly improve the overall treatment rate of patients, improve quality of life and reduce the pain of patients. Therefore, it is worth of being promoted in clinical treatment.

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