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## **Injuries of hands with a circular saw in agriculture**

### **Obrażenia rąk na pile tarczowej jako wypadki rolnicze**

**Injuries to the hands with a circular saw, because of their complex mechanism, cause extensive and multi-tissue traumas, which constitute a serious therapeutic problem. An appropriate decision concerning the type of treatment is fundamental to success. In the present article 1665 cases of hand injuries sustained with a circular saw were evaluated. In the majority of cases, the injuries occurred in males at the productive age, residents of rural areas. The authors point to frequent problems with wound healing and complications caused by infections and a complex, multi-tissue nature of hand injuries.**

#### **Introduction**

The progress in mechanization of work, rush, incompetence, ignoring the rules of labour safety and hygiene are the main causes of an increasing rate of injuries to the hands. They constitute one of the primary problems in contemporary traumatology, because of their incidence rate, costs and social consequences [1,2,3,4].

The injuries to the hands with a circular saw, because of their complex mechanism, lead to extensive, multi-tissue, severe traumas, causing a serious therapeutic problem. Taking an appropriate decision on the type of treatment is a mandatory condition of success [1,4,5,6,7].

#### **Aim of study**

The aim of the study was to evaluate treatment of hand injuries and to present the principles of their management at the scene of the accident and during transport.

#### **Material and method**

The present work is a survey of injuries to the hands received during work with a circular saw in the years 2005-2006. Eight doctors, specialists in various disciplines, and five trauma surgeons from the out-patient clinic within the emergency department of St Lucas Hospital in Tarnów dealt with this problem.

It is generally approved that restora-

*Zranienia rąk pilą tarczową, z powodu ich złożonego mechanizmu, powodują obszerne i wielotkankowe uszkodzenia, które stanowią poważny problem terapeutyczny. Podstawą sukcesu jest odpowiednia decyzja dotycząca sposobu leczenia. W prezentowanym artykule przeprowadzono analizę leczenia i wyników 1665 przypadków obrażeń ręki pilą tarczową u ludzi pracujących w rolnictwie. W większości przypadków zranienia stwierdzano u mężczyzn w wieku produkcyjnym, mieszkańców wiejskich obszarów. Autorzy wskazują na częste z gojeniem ran pourazowych i komplikacje spowodowane przez zakażenia, oraz wielotkankowy charakter obrażeń ręki.*

tion of full ability of the hand after this type of injury is difficult and often impossible to achieve, even in the best medical centers.

In the above mentioned period, a total of 56682 injuries were reported. Among them 4092 were hand injuries, out of which 1665 (40.7%) were caused by a circular saw. The S63 procedure was ruled out from the investigation.

The collected material was evaluated according to the criteria, such as: age, sex, place of residence, extent of injury, therapeutic procedures, further fate of the patient (ambulatory treatment or hospitalization).

#### **Results and discussion**

The evaluated injuries to the hand occurred mainly in males residents of rural areas (Table I, II).

This type of injury occurred ten-fold more frequently in rural population than in urban and concerned mainly males at productive age (Table III).

Analysis of the localisation of traumas showed that the injuries to the right hand were slightly outnumbered by injuries to the left hand; in both hands finger II was injured with equal rate. Simultaneous amputation of several fingers occurred in one third of cases and was more common in the left hand.

An extensive laceration was often accompanied by injury to the bones, liga-

ments and nerves. Injuries with a circular saw most often happened in May, July and November, which was probably related to increased farm work in these months.

In the majority of patients, the cause of injury was incompetence for this type of work, lack of a shield protecting the cutting part of the tool and alcohol consumption.

In case of injuries to the hand with a circular saw, the generally adopted by us procedure was a quick and definite treatment. If possible, we aimed at the reconstruction of the anatomical features and functional restoration of the hand according to the following schedule for this type of wounds:

1. Selecting the site of the procedure, providing appropriate anaesthesia.

2. Wound toilet: rinsing with physiological saline, cleansing the skin with Manusan, brushing and removing incrustation.

3. Surgical cleansing, surgery in case of ischaemia under consideration.

4. Careful revision of injuries: assessment of the covering the wound with the skin, determining the extent of injuries, assessment of blood supply, excision of the crushed and ischaemic tissues.

5. Treatment of the wounds:

- a) repair of the bones and joints,
- b) repair of the tendons,
- c) restoration of the blood supply,
- d) repair of the nerves,
- e) wound closure: "nothing by force", considering skin grafts and other types of grafts from adjacent areas, suturing into abdominal wall + drainage,

6. Desmurgia, splinting with Kleinert's method.

In case of partial amputation of less important fingers (III, IV and V), we shortened them in order to close the wound and promote quicker healing. Severe cases, requiring amputation of the hand or forearm were referred to replantation centres. Patients requiring surgical procedures in the operating room and the use of instruments unavailable in the emergency department were admitted to the orthopaedic and trauma ward. According to this protocol, 225 patients, out of which 152 were injured with a circular saw, were hospitalized

Despite the adopted schedule for the treatment, there were some discrepancies resulting from different approach to the cases by the doctors on duty. Insufficient documentation prevented full reconstruction of the procedures and their final results. It was noted that the prescribed an-

**Tabela I**

**The number of counsels concerning hand injuries provided in the surgical out-patient clinic and trauma center.**

Liczba porad dotyczących obrażeń ręki przeprowadzonych w poradni chirurgicznej i oddziale urazowo-ortopedycznym.

Year	Total number of counsels	Injuries to the hands with a circular saw		
		Females	Males	Total
2005	29617	41	723	764
2006	27065	44	857	901
Total	56682	85	1580	1665

**Tabela II**

**Incidence of hand injuries in urban and rural areas of residence.**

Częstość obrażeń rąk w obszarze miejskim i wiejskim.

Area of residence	Number of patients	%
Urban population	171	10,27
Rural population	1494	89,73
Total	1665	100,00

**Tabela III**

**Age of patients at the moment of injury.**

Wiek pacjentów w chwili urazu.

Age	0-17	18-60	61-80	Total
Number	160	1234	271	1665
%	9,6	74,1	16,3	100,00

tibiotics had only an adjuvant role and did not prevent from infection, especially after the surgeries performed in an insensitive and careless way.

In some patients, massive bone infection developed and treatment was prolonged up to several months. One third of cases terminated in permanent disability. In a number cases, a definite and single surgery lead to uncomplicated healing. These patients, in spite of their disability caused by the loss of parts of their fingers, could after a short time return to work with the so-called "soft hand". However, frequent purulent infections induced the change in the treatment, especially in severe and complicated cases. In our conditions, lacking the possibility of rehabilitation, the only appropriate management seems to be the proper tactics of therapy with deferred operation [3,8-10].

#### **Principles of management of patients with hand injuries at the scene of the accident**

The restoration of the function of the hand, to a large extent, depends on the first aid provided by medical practitioners at the scene of the accident. Therefore, on the basis of own observations and literature, we present the principles of management of patients with hand injuries at the scene of the accident and during their transport [1,7,8,11,12].

1. After initial assessment of the extent

of injury, a sterile dressing should be applied on the wound gently compressing it, considerably decreasing or even eliminating bleeding.

2. The Esmarch's band should not be put above the wound, since it impairs the blood supply to the limb and the pressure may cause damage to the peripheral nerves.

3. Bleeding should not be arrested with homeostatic forceps, since they crush the stumps of blood vessels, preventing their later anastomosis.

4. All rings should be removed from the fingers since their swelling may cause ischaemia.

5. The hand and the forearm should be immobilized with the Kramer's splint, supported by a sling during transport, which reduces bleeding, oedema and pain.

6. A strong analgesic should be administered.

7. In case of extensive hand injury with significant blood loss or crushed tissues, standards of management for post-traumatic shock should be employed and blood collected for blood-grouping.

8. In case of amputation, the stump of the limb should be covered with a compressing, sterile dressing, the amputated part should be wrapped in a wet sterile dressing, put into a sterile sack tightly closed, and transported immersed in cold water with ice-cubs. (Unfortunately, a casualty is rarely able to describe the in-

jury properly, and therefore the emergency teams frequently arrive at the scene unprepared for such type of accidents).

### Conclusions

1. Hand injuries with a circular saw, which affect mainly males at the productive age (74.1%), in majority of cases lead to permanent disability.

2. In complex cases of hand injury, impeded by infection, it seems advisable to postpone definite surgical treatment.

3. Our observation shows the necessity of creation of a specialist out-patient clinic for hand injuries where further tre-

atment and rehabilitation can be provided.

4. Alcohol is the cause of the majority of hand injuries sustained at work with a circular saw.

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