



Original article

## EPIDEMIOLOGY OF “O’DONOGHUE’S TRIAD”

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### SUMMARY

The term “Unhappy Triad”, coined by O’Donoghue, reflects a severe knee injury with rupture of the medial collateral ligament, medial meniscus, and anterior cruciate ligament. The triad is primarily a sports injury, and patients’ recovery is 6 to 12 months.

**Material/Methods:** 70 patients with “O’Donoghue’s triad” were studied. Total anterior cruciate ligament rupture was reconstructed with patellae ligament autograft; medial meniscus tear was treated with partial meniscectomy; and medial collateral ligament injury was treated conservatively at 1 month before surgery.

**The aim of the study** is to establish the epidemiology of the injury: age and gender distribution, distribution by types of sports in patients with “O’Donoghue’s Triad” after arthroscopic treatment. 222 persons were examined in two stages – first, 187 with various soft tissue injuries of the knee, after surgical treatment, including persons with the triad, and second, 70 patients with O’Donoghue’s triad.

**Results:** The study shows that among 18-19-year-olds, the triad was found in 4 people; from 20 to 29 in 34, from 30 to 39 in 23, and from 40 to 49 in 9. In terms of gender, there were 62 men (86.11%) and 8 women (13.89%) with the triad injury. “O’Donoghue’s Triad” was obtained during sports in 91.52% of cases, the remaining 8.48% in car accidents and household accidents.

**Conclusions:** The results of the study establish and provide coaches, physiotherapists, orthopedists, scientists and educators with up-to-date data on the epidemiology of O’Donoghue’s Triad, its incidence, age and sex characteristics and its distribution by sport.

**Keywords:** knee, “Unhappy Triad”, ACL, MCL, meniscus, physiotherapy,

### INTRODUCTION

One of the most severe and slowly recovering injuries of the musculoskeletal system is the “O’Donoghue Triad” or the so-called “Unhappy Triad” [1]. The term “Unhappy triad” was coined by O’Donoghue, who described it as: an MCL tear, medial meniscus injury, and ACL tear [2]. Immediately after the injury there is static and dynamic instability of the knee joint, which hides a high risk of dislocation of the knee and damage to other tissues: rupture of the joint capsule, rupture of the chondral tissue, rupture of the lateral collateral ligament, damage to the lateral meniscus and others [1]. O’Donoghue found that the incidence of injured sports knee was 25% [3].

“O’Donoghue’s triad” is most often associated with a car accident, industrial accident or sports injury. Intense contact sports, such as football and rugby, and sports involving sudden explosive changes in movements, such as skiing, martial arts, etc., are at particular risk of injuries involving the three components [4].

The severity of the injury and the long recovery process of the patients is the reason why the triad qualifies as one of the most terrible sports injuries. In the multiligamentous injury “O’Donoghue’s Triad”, after surgical treatment, main symptoms such as edema, pain, reflex muscle inhibition, dynamic instability in all planes, reduced myoarticular laxity, muscle hypotrophy, myoarticular contractures, muscle imbalance, impaired proprioception are identified etc.

There are well-established physical therapeutic methodologies in accordance with the rehabilitation potential and the needs of the athletes, as in some of the cases of incorrect rehabilitation or their early return to sports activity, recurrences happen. This imposes the development of prevention strategies involving multidisciplinary teams between which there is a systematical exchange of information about the athlete’s condition in order to prevent soft tissue damage or to reduce the risk of relapses [5].

Regarding the time to return to sports activity, experts have different opinions. The period can vary from a minimum of 6 months to an average of 9 to 12 months [6].

Epidemiological research will provide valuable information on which are the risky sports, age and sex, in order to work in the direction of prevention against the “Unhappy Triad”.

**The aim of the study** was to investigate the epidemiology of O’Donoghue’s Triad after arthroscopic treatment.

## MATERIAL/METHODS

**The tasks are:** establishing the relative share of the types of soft tissue damage of the knee joint; the age distribution of patients with O'Donoghue's Triad; frequency by sex; by types of sports; the relative proportion of 'O'Donoghue's Triad' in contact and non-contact sports.

**Organization of the study:** The study was conducted in the period from 2013 to 2020 in the city of Sofia, in the Multispecialty Hospital for Active Treatment "Sveta Sofia", Military Medical Academy, Government Hospital and in a kinesitherapy office in the city of Bansko. It was preceded by individual informed consent of the patients.

**Study contingent.** Seventy patients with "O'Donoghue's triad" with total ACL rupture reconstructed with ligament patellae autograft by the BPTB (Bone-Patellar Tendon-Bone) method, with medial meniscus rupture treated with partial meniscectomy and with damage to MCL treated conservatively, with the knee immobilized 1 month before surgery.

The study was conducted in two stages - the first included an 8-month study of the soft tissue injuries of the knee joint indicated in Table 1 in 187 patients. Among

other soft tissue injuries of the knee, 35 persons with O'Donoghue triads have been identified.

In the second stage, the study was directed only to patients with a triad of the knee joint diagnosed in 35 other persons, mostly athletes, and was conducted in a specialized kinesitherapy office in the winter ski resort in the city of Bansko, Bulgaria. Thus, the total number of patients with triad treated surgically is 70.

## RESULTS AND ANALYSIS

The distribution of soft-tissue injuries of the knee joint in 187 patients diagnosed during the first stage of the study is shown in Table 1. The results showed that the relative proportion of ACL rupture was 33.7%, followed by MCL injury - 19.8%, O'Donoghue's Triad - 18.7%, followed by partial meniscectomy of the medial meniscus - 11.8%, meniscus suture - 7%, partial meniscectomy of the lateral meniscus - 6.4%, chondroplasty using the microfracture method - 2.7%.

The reported data indicate that the "Unhappy triad" or "O'Donoghue's triad" is not a rare injury due to an incidence of about 1/5 (18.7%) of soft tissue injuries of the knee.

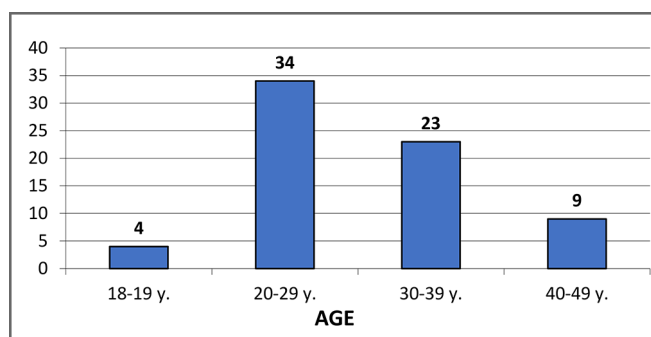
**Table 1.** Structure of soft tissue injuries of the knee joint.

Pathology	% of pathology from soft tissue injuries of the knee
ACL	33,7
O'Donoghue's triad	18,7
Partial meniscectomy of the medial meniscus	11,8
Partial meniscectomy of the lateral meniscus	6,4
Meniscus suture	7,0
MCL	19,8
Chondroplasty using the microfracture method	2,7
Total:	100%

**The age structure** of the studied contingent of 70 individuals with "O'Donoghue's triad" shows early damage and the smallest frequency in the group under 20 years of age - 4 individuals (Fig. 1), but we must point out that not because they are physically inactive, but because of the fact, that surgeons avoid ACL reconstruction until age 21 because the growth canal in the knee is active until age 20-21 and said surgery can compromise it and lead to a difference in the length of the two legs.

The largest number of patients - 34 are from the 20-29 age group, which is also the most active and professionally engaged in sports. A group of 23 triad patients aged 30-39 years and 9 patients aged 40 to 49 years followed.

**Fig. 1.** Distribution of damage by age groups



The results of the study also show that the **gender** distribution of the patients is as follows: out of 70 examined with the triad, 62 are men, and 8 are women, with a relative share of 86.11% for men and 13.89% for women, respectively. It can be seen that “O’Donoghue’s triad” is many times more common in men than in women.

Of a total of 70 individuals with O’Donoghue’s triad studied, the injury was acquired during sports in 64 patients, and the remaining 6 were the result of transport accidents and domestic trauma. “Unhappy Triad” was received during sports in 91.52% of cases and in 8.48% in non-sports persons, which gives us reason to qualify it as one of the most serious sports injuries.

**The sport** giving rise to the most cases of O’Donoghue’s triad was football, with 34 patients (male), followed by alpine skiing, with 11 patients (8 males and 3 females). In third place with 8 patients (men) are martial arts (MMA – 4, Taekwondo – 3, Judo – 1), followed by basketball with 7 patients (5 men and 2 women) and volleyball with 4 patients (3 men and 1 woman). Among the non-athletes - 6 patients (4 men and 2 women).

Our research results show that contact sports cause 75.79% of O’Donoghue Triad injuries (Football - 48.62%, Martial Arts - 11.44%, volleyball - 10.01%, basketball - 5.72 %). In non-contact sports (alpine skiing), it is 15.73%, and in non-sports (transport accidents and domestic injuries), it is 8.48%.

## DISCUSSION

The knee joint, together with the hip and ankle joint, is anatomically adapted to ensure the mobility and stability of the lower limb [7]. “O’Donoghue’s triad” is considered a severe multiligamentous sports injury. It is also called the “Unhappy triad” because a large percentage of athletes do not return to the sport [8]. Recovery after surgical treatment is prolonged for about one year [9].

Posch M, et al. studied 282 skiers with injuries, one-third of which were knee injuries. [10] Of the total study sample, 64.5% (n = 182) were ACL injuries with associated injuries, and about 35.5% (n = 100) were isolated ACL injuries. Concomitant diagnoses of injured ACLs were (MCL)

(n = 92, 50.5%), medial meniscus (MM) (n = 73, 40.1%) and (LCL) (n = 41, 22.5%) injuries. %). This study confirms the high incidence and epidemiology of the “O’Donoghue’s triad” in sports practice. The results of our research on relatives confirm this trend in Bulgaria as well.

Bakshi NK et al. studied 50 National Football League (NFL) athletes with multiligament knee injuries and their return back to playing. [11] The overall percentage of those who returned to sports was 64.0%. 23-year-old soccer players with ACL/MCL and medial meniscus tears returned to play - 70.8%. The mean time to return to play for these athletes was 305.1 ± 58.9 days. The return-to-sport rate of athletes with multiligamentous knee injuries is significantly lower than that of athletes with isolated ACL tears.

The return of patients to sports, work, domestic and other activities is slow and prolonged, with the high social significance of the problem [12].

## CONCLUSION

- Of 187 soft tissue knee injuries studied, the “O’Donoghue Triad” was the third most common, after ACL rupture and MCL injury [13].

- In terms of age, the mentioned injury is most common in the active sports age and a little after it (20-39 years - 81.43%).

- “O’Donoghue’s triad” predominates in men (86.11% of 70 individuals examined) and is significantly less common in women (13.89%).

- The “Unhappy triad” is a sports injury (athletes are 91.52% of 70 individuals examined).

- “O’Donoghue’s Triad” predominates in contact sports.

- The research and results provide up-to-date data on the epidemiology of “O’Donoghue’s Triad” in Bulgaria.

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