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ORIGINAL ARTICLE
SPORT INJURIES AND REHABILITATION

Incidence of injuries and associated risk factors in a sample of Italian recreational padel players

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ABSTRACT

BACKGROUND: Padel is a racket sport similar to tennis, which since the COVID-19 pandemic has been gaining popularity among recreational players. Despite its popularity, epidemiological studies are still lacking. This study aimed to identify the prevalence of injuries among Italian recreational padel players and associated risk factors.

METHODS: A questionnaire was administered to 127 recreational padel players between January 2022 to March 2022. The questionnaire consisted of questions to collect information regarding intrinsic and extrinsic factors related to padel practice, injury location, and injury typology. Frequencies and proportions were calculated for variable description. Binomial logistic regression was adopted to identify potential risk factors.

RESULTS: Of the 127 participants, 100 (78.8%) reported having had an injury during the previous year. Such injury in most cases (37%) resulted in an absence from padel from 8 to 28 days. The most common injury locations were lower leg/Achilles tendon (17.1%) and elbow (13.8%), while the most common injury typologies were tendinopathies (33.6%) and contusions (14.9%). Among the identified risk factors the amount of time played padel (3.5-5 hours/week), racket type (round), and racket weight (either not knowing or 356-375 g) resulted in an increase in the probability of occurring an injury.

CONCLUSIONS: Recreational padel results in a high percentage of injuries. These frequently result in tendinopathies of the Achilles tendon and elbow. Inadequate racket characteristics and the amount of time played could contribute to an increase in injury incidence.

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KEY WORDS: Wounds and injuries; Risk factors; Epidemiology.

Padel is a double racket sport born in Mexico in 1962[1] that has become very popular in Spain during the last decades[2] and has increased its popularity in other countries during the COVID-19 pandemic. Since then, the interest of the scientific community has grown with numerous investigations that have evaluated different aspects of this sport. These range from those related to performance,[3] biomechanics,[4] injury incidence,[5] injury prevention,[6] and technical aspects.[7] Despite the similarities to other racket sports, there are significant differences in terms of performance pattern[8] as the court differs from that of tennis, table tennis, badminton, or squash.[2, 4] Padel is the only racket sport that has a court surrounded by walls on which players can bounce the ball, which results in a very fast pace of play.[6] Furthermore, substantial differences can be observed in the racket used which is a short-handed pad racket of different shapes with a foam core and an outer shell which can be made of carbon, fiberglass, graphite, or other solid materials.[9] These peculiar characteristics and the high playing intensity attributed to padel[10] can lead to specific injury patterns. Previous studies evaluating the epidemiology of injuries in padel[5, 6, 11-13] generally agree that there is a high rate of injuries, especially in recreational players. Regarding injury location, differences emerge

across the studies since some investigations have shown that lower limb injuries are more frequent,[6] while others have reported a higher percentage of upper limb injuries, with particular prevalence in the elbow.[5, 12, 13] It should be noted that among these studies, the research by Muñoz *et al.*,[5] has investigated only the incidence of upper limb injuries, thus not allowing an adequate comparison with other investigations.

Regarding injury typology, the studies by García-Fernández *et al.*[11] and Muñoz *et al.*[5] reported an overview of the different injury typologies with both investigations agreeing that tendinopathies were the most frequently observed. Although previously published studies in the literature report useful data concerning the epidemiology of injuries in padel, it is important to note that 4 out of 5 of these studies were conducted in Spain, all of which included recreational padel players, while the only study carried out in a different location (Italy) was conducted in professional players, therefore either the location and the analyzed populations may represent a limitation for the interpretation and generalization of data.

In order to limit injury occurrence, research has tried to identify possible injury risk factors. In the study by Castillo-Lozano *et al.*[12] a multiple regression analysis was conducted for this purpose identifying that age, body mass, and laterality of participants may significantly influence the incidence of injury. Conversely, Priego Quesada *et al.*[6] by using proportion analysis, have excluded that age, gender, and laterality can be considered relevant risk factors and have identified that the use of specific padel shoes may increase the risk of injury. Very different risk factors were identified by Munoz *et al.*[5] through proportion analysis, emphasizing that racket characteristics, the volume of weekly practice, player experience, and gender may increase the risk of injury. Considering the consistent heterogeneity across studies, it is not possible, to date, to understand which risk factors may contribute to an increased injury risk in padel. With this study, we aimed to identify the incidence of injury, injury location, and injury typology in a sample of Italian recreational padel players by adopting the recommendations developed for epidemiological studies in tennis.[14] The second aim of this study was to identify possible associated injury risk factors.

Materials and methods

Research design

The STROBE Guidelines were followed to conduct this observational study.[15] Data collection consisted of a retrospective self-administered custom-made questionnaire accessible from January 2022 to March 2022.

Sample

The research was conducted in accordance with the recommendations of the Declaration of Helsinki and approved by the Ethics Committee of the Faculty of Sport and Physical Education of the University of Novi Sad (Novi Sad, Serbia; N. 47-06-02/2021-1). The sample consisted of participants who played padel recreationally. Eligibility criteria included: 1) being at least 18 years of age; 2) be resident in Italy; 3) playing padel regularly (at least 1 match/training session per week); and 4) not being engaged in professional padel tournaments.

Questionnaire and study variables

The questionnaire was adapted from the recommendations developed for epidemiological studies in tennis,[14] and additional information was adapted from the questionnaire presented in previous investigations.[6] The questionnaire allowed to obtain information regarding the respondent's information (sex, age, weight, height, handiness, and city of residence) and information on their participation in padel. Age was categorized as 18-35, 36-50, 51-65, above 65, while residence city as north, center or south. Respondent's information also included participation to padel defined as how long participants had been playing padel, how many hours per week they spent playing padel, whether they played other racket sports, and whether they engaged in other sports. Time practicing padel was categorized as <1 year, 1-3 years, 4-5 years or >5 years, while weekly time playing padel as 1-3 hours, 3.5-5 hours or >5 hours. Moreover, information regarding technical equipment used during padel matches or training was also retained for investigation. These included the use of specific shoes, the type, weight, and material of the racket. In the case of the participants using multiple technical equipment, they had to respond based on what they used the most. Type of racket was categorized as round, diamond or teardrop, and racket weight as 330-355 g, 356-375 g, 376-390 g or I do not know; while rackets material as graphite, carbon fiber, fiberglass or I do not know.

The questionnaire also made it possible to obtain information on the number of injuries that the respondent had suffered in the last year. According to the abovementioned guidelines,[14] an injury is defined as "any physical or psychological complaint or manifestation sustained by a player that results from a padel match or padel training,

irrespective of the need for medical attention or time loss from padel activities." In detail, regarding the injuries, information relating to the location of injury and the type of injury was also investigated. Location of injuries were classified as: head/face, neck/cervical spine, shoulder/clavicle, upper arm, elbow, forearm, wrist, hand/finger/thumb, sternum/ribs/upper back, abdomen, lower back/pelvis/sacrum, hip/groin, thigh, knee, lower leg/Achilles tendon, ankle and foot/toe. Type of injuries were classified as: fractures, other bone injury, ligament injury, dislocation/subluxation/instability, lesion to meniscus/articular cartilage, synovitis, muscle rupture/tear/spasm/cramp, muscle rupture/tear/spasm/cramp, hematoma/contusion/bruise, abrasion/laceration, central/peripheral nervous system damage or other.

Each participant was encouraged to choose a category according to the medical advice they had received. If no medical advice was received, participants could indicate more general locations for injury location and "other" for injury typology (*i.e.*, head and neck, upper limb, trunk and lower limb for injury location, and bone, joint and ligament, muscle and tendon, skin, nervous system or other for injury typology).

Process

Once the above-described questionnaire had been prepared to match the study needs, data were collected through automatized forms created through Google (Google Forms; Google, Mountain View, CA, USA). To reach a large and diverse population of recreational padel players across Italy, the questionnaire was e-mailed to Italian padel clubs. The link to the questionnaire was also posted on social media in groups related to padel. Weekly reminders were provided by one of the investigators. Each participant filled out the questionnaire voluntarily. Incomplete questionnaires were excluded from the investigation.

Statistical analysis

Data were analyzed through Jamovi (v. 1.8.0.1; The Jamovi project [2021]; https://www.jamovi.org). Only the data of those who responded to each question of the questionnaire were retained for investigation. Data are presented as frequencies and proportions (*i.e.*, percentages). To identify possible injury risk factors a binomial logistic regression was performed including all variables analyzed within the questionnaire. The dependent variable was considered to have undergone an injury during the last year. Odds Ratios (OR) and 95% confidence intervals (CI) were included. Significance was set at $P<0.05$ for all analyses.

Results

A total of 127 participants, who met the inclusion criteria, completed the questionnaire. Table I shows the demographic data of the participants. These are stratified according to those who reported having suffered an injury during the last year (N. 100/127; 78.7%) and those who did not report any injury (N. 27/127; 21.3%). Data regarding handedness, residence, experience, and hours per week spent playing padel are also reported. Injury location and typology are presented in Table II. It is possible to note that most of the injuries have resulted in an absence from padel between 8 and 28 days. According to the participant's responses, the majority of the injuries affected the lower limb (93/181), with the most frequent location being the lower leg/Achilles tendon (31/181, 17.1%). Other frequent location was the upper limb (66/181), with the most frequent injury site being the elbow (25/181, 13.8%). The most frequent injury typologies were muscle and tendon injuries (76/181), with tendon tear/tendinopathy/bursitis the most reported sub-typology as well as skin lesions (45/181), with hematoma/contusion/bruise the most reported sub-typology. A comparison of the proportions among intrinsic and extrinsic risk factors between injured

TABLE I.—*Descriptive data of the participants.*

Parameters	N./mean±SD (%)		
	Total	Injured	Non-injured
N.	127	100	27
Age (years)	44.5±10.3	44.3±9.6	45.1±12.7
Height (cm)	172.6±16.4	173.9±9.1	167.8±30.9
Weight (kg)	76.2±14.4	76.2±14.8	76.3±13.0
Sex			
Man	94 (74)	72 (72)	22 (81.5)
Women	33 (26)	28 (28)	5 (18.5)
Handedness			
Right	117 (92.1)	91 (91)	26 (96.3)
Left	10 (7.9)	9 (9)	1 (3.7)
Residence			
North Italy	35 (27.6)	26 (26)	9 (33.3)
Center Italy	60 (47.2)	46 (46)	14 (51.9)
South Italy	32 (25.2)	28 (28)	4 (14.8)
Experience			
<1 year	44 (34.6)	33 (33)	11 (40.7)
1-3 years	64 (50.4)	54 (54)	10 (37.0)
4-5 years	9 (7.1)	6 (6)	3 (11.1)
>5 years	10 (7.9)	7 (7)	3 (11.1)
Hours/week spent playing padel			
1-3	55 (43.3)	38 (38)	17 (63)
3.5-5	41 (32.3)	39 (39)	2 (7.4)
5.5-7	23 (18.1)	19 (19)	4 (14.8)
>7	8 (6.3)	4 (4)	4 (14.8)

% are calculated for each sub-population.
SD: standard deviation.

TABLE II.—*Injury type and location of the participants.*

Parameters	N. total	%
Injured (N. of participant)		
Yes	100	
No	27	
Return to play		
<1 day	10	
1-3 days	12	
4-7 days	20	
8-28 days	37	
>28 days	21	
Total N. of injuries (N./%)	181	100
Location (N. of injuries)		
Head and neck	10	5.5
Head/face	7	3.9
Neck/cervical spine	3	1.7
Upper limb	66	36.5
Shoulder/clavicle	15	8.3
Upper arm	8	4.4
Elbow	25	13.8
Forearm	4	2.2
Wrist	9	5.0
Hand/finger/thumb	5	2.8
Trunk	12	6.6
Sternum/ribs/upper back	2	1.1
Abdomen	0	0.0
Lower back/pelvis/sacrum	10	5.5
Lower Limb	93	51.4
Hip/groin	6	3.3
Thigh	11	6.1
Knee	16	8.8
Lower leg/Achilles tendon	31	17.1
Ankle	15	8.3
Foot/toe	14	7.7
Typology		
Bone	16	8.8
Fracture	3	1.7
Other bone injury	13	7.2
Joint and ligament	34	18.8
Dislocation/subluxation/instability	10	5.5
Ligament injury	10	5.5
Lesion of meniscus/articular cartilage	10	5.5
Synovitis	4	2.2
Muscle and tendon	76	42.0
Muscle rupture/tear/spasm/cramp	15	8.3
Tendon tear/tendinopathy/bursitis	61	33.6
Skin	45	24.8
Hematoma/contusion/bruise	27	14.9
Abrasion/laceration	18	9.9
Central/peripheral nervous system	5	2.8
Other	5	2.8

The injuries of the "central/peripheral nervous system" and "other", under "typology", refer to injuries of nerves, eyes and teeth.

TABLE III.—*Comparison of injury risk factors between injured and non-injured participants.*

Parameters	Injured		Non-injured		P	OR	CI
	N.	%	N.	%			
Gender							
Man	72	72	22	81.5	0.305	1.71	0.59-4.96
Women	28	28	5	18.5		0.58	0.20-1.69
Age							
18-35	18	18	4	14.8	0.614	1.22	0.03-2.10
36-50	55	55	15	55.6		0.81	0.24-2.77
51-65	25	25	6	22.2		0.92	0.22-3.77
>65	2	2	2	7.4		0.22	0.02-2.09
Handedness							
Right	91	91	26	96.3	0.553	2.29	0.27-19.12
Left	9	9	1	3.7		0.44	0.05-3.66
Residence							
North Italy	26	26	9	33.3	0.332	0.87	0.33-2.31
Center Italy	46	46	14	51.9		1.14	0.43-2.99
South Italy	28	28	4	14.8		2.42	0.66-8.83
Experience							
<1 year	33	33	11	40.7	0.427	1.80	0.69-4.67
1-3 years	54	54	10	37.0		0.56	0.21-1.45
4-5 years	6	6	3	11.1		2.70	0.57-12.6
>5 years	7	7	3	11.1		2.31	0.51-10.49
Padel physical training							
Yes	16	16	4	14.8	0.880	1.10	0.33-3.60
No	84	84	23	85.2		0.91	0.28-3.00
Hours/week playing padel							
1-3	38	38	17	63.0	0.002*	0.11	0.02-0.53
3.5-5*	39	39	2	7.4		8.27	1.88-40.36
>5	23	23	8	29.6		2.12	0.62-7.20
Specific padel shoes							
Yes	84	84	20	74.1	0.250	1.84	0.67-5.06
No	16	16	7	25.9		0.54	0.19-1.50
Position in field							
Right	40	40	8	29.6	0.507	0.75	0.25-2.22
Left	30	30	8	29.6		1.33	0.44-3.96
Indifferent	30	30	11	40.7		1.83	0.65-5.11
Racket shape							
Diamond	25	25	4	14.8	0.026*	0.91	0.23-3.56
Teardrop	34	34	17	63.0		0.29	0.10-0.82
Round*	41	41	6	22.2		3.42	1.21-9.63
Racket material							
Carbon fiber	68	68	18	66.7	0.727	2.27	0.49-10.39
Fiberglass	5	5	3	11.1		0.44	0.09-2.02
Graphite	4	4	1	3.7		1.06	0.11-10.07
I do not know*	23	23	5	18.5		1.21	0.40-3.65
Racket weight							
330-355 g	22	22	5	18.5	0.045*	0.79	0.25-2.54
356-375 g*	61	61	11	40.7		1.26	0.39-4.04
376-390 g	13	13	6	22.2		0.39	0.12-1.24
>390 g	1	1	0	0.0		1.31	0.00-na
I do not know*	3	3	5	18.5		0.10	0.00-na

Each % has been calculated considering the appropriate subpopulation described in Table I (na: not applicable).
*Significant P<0.05.

and non-injured respondents is reported in Table III. No significant differences were found for gender, age, and handedness concerning the intrinsic factors (P>0.05). No significant differences were found for residence, training experience, physical training other than padel, specific padel shoes, position in the field, and racket material concerning the extrinsic factors (P>0.05). However, spending between 3.5 to 5 hours per week playing padel, using a

round racket of a weight of 356-375g (or not knowing the weight of the racket) significantly increased the risk of injury in our sample of Italian recreational padel players.

Discussion

This study aimed to understand the epidemiology of injuries in a sample of Italian recreational padel players and to evaluate associated injury risk factors. Our results highlighted that a very large number of padel players underwent an injury during the last year. These were more frequently observed in the lower leg/Achilles tendon and the elbow, with tendon tear/tendinopathy/bursitis being the most frequently observed injury typology. Our results are in line with previous research, since a generally high proportion of injuries has been observed in recreational padel players.[13, 16] The majority of the literature highlights that the most frequent injury location in padel players is the elbow,[5, 12, 13, 16, 17] with frequencies of 74.4%,[16] 36.7%,[12] 35%,[5] 29.8%,[17] and 25.9%.[13] In our investigation the percentage of injuries occurring in the elbow was lower (13.8% of the total injuries) despite the type of population is similar, except for that of Tagliafico *et al.* The only study that has shown a higher incidence of injuries in a different location, is that of Priego Quesada *et al.*[6] in which a higher frequency was observed in the lower limb. However, the authors do not specify which joint but only provide an overall number for the whole limb (53.1%), which is very similar to that observed in the present study (51.4%). Despite the difference observed between other investigations and the present results, it should be noted that the elbow was the second most frequent location that we found. Since padel is a racket sport, it is not surprising that the elbow is a frequent injury location. As a matter of fact, the most common injury in tennis is lateral epicondylitis, which is commonly referred to as tennis elbow.[18] According to Abrams *et al.*,[18] the injury of the gastrocnemius or Achilles tendon in tennis accounts for 16% of the total injuries. This percentage is almost comparable to that observed in our sample of padel players for the Achilles tendon (17.1%). Despite similarities between tennis and padel, the latter is characterized by more frequent accelerations/and decelerations, which differently from those on a frontal plane (lateral displacements), more frequently observed during tennis matches, are more evident in the sagittal plane (anterior-posterior displacements).[19, 20] This difference in game dynamic should be considered as a discriminant for a better understanding of injury epidemiology in padel. Since padel players also experience a higher amount of sprints, running inversions, rotations and stoppings,[6] this could explain the greater amount of lower leg injuries (as those frequently observed in the Achilles tendon) compared to those observed in tennis players.[18] Concerning injury typology, not many studies report detailed descriptions. To the best of our knowledge, only the studies of Munoz *et al.*,[5] Priego Quesada *et al.*,[6] and Tagliafico *et al.*[13] report injury typologies in padel players. In all analyzed studies, tendinopathy is the most frequent injury typology. In particular, Munoz *et al.*[5] and Priego Quesada *et al.*[6] report a high frequency of tendinous lesions, while Tagliafico *et al.*[13] details the type of tendinopathy reporting epicondylitis as the most frequent diagnosis. Similarly, to the abovementioned studies and other racket sports,[21, 22] musculoskeletal injuries were those more frequently observed in this study (42%) with the most common injury typology as tendinopathy (33.6%). Consistent with the literature,[6] acute injuries as those occurring at joints and ligaments, or overuse injuries as tendinopathies are very frequent among padel players. Additionally, we also observed a high frequency of skin lesions as hematoma/contusion/bruise which, however, are not reported in any other study investigating injury typology in padel. Conversely, epidemiological studies for tennis highlight that skin lesions account only for 6% of the total injuries.[23] It is plausible that the different game dynamics (direction of movement, number of accelerations and decelerations) determine a more frequent interaction with the ground or the surrounding walls. However, it is important to note that, for both injury location and injury typology, none of the abovementioned studies adopted a standardized and validated questionnaire. Therefore, it is plausible that the inclusion or omission of certain specific categories for each questionnaire may have led to different interpretations in the final outcomes. To date, although a specific questionnaire for epidemiological studies in padel is not present, we conformed to that developed for epidemiological studies in tennis[14] in order to improve consistency in reporting for injury type and locations. Further, it is important to underline that all investigations, including our own, have evaluated injury incidence and typology, by a self-administered questionnaire, therefore, all data are retrospective and may encounter reporting bias, misunderstanding of certain terms or contents or forgetfulness of participants. The second aim of this study was to identify possible injury risk factors among those included in the questionnaire. Intrinsic and extrinsic factors were analyzed, and only extrinsic factors were determined to increase injury risk. Weekly time spent playing padel, in particular, those

participants playing between 3.5 and 5 hours per week and racket characteristics such as the shape (round racket) and weight (either not knowing or a racket weighting between 356 and 375g) were identified to increase the risk of injury. Our results are partially in line with the investigation of Munoz *et al.*[5] who identified not only racket characteristics and weekly volume, but also gender as risk factors. In particular Munoz *et al.*[5] reports that a racket with a weight greater than 350g increases the risk of injury. While no differences were reported among racket shape. Conversely, concerning weekly volume the authors reported an increased risk for those playing more than 6 hours/week. It is interesting to note that Munoz *et al.*[5] identified that playing other sports or practicing physical training neither increased nor reduced the risk of injury. In practical terms playing between 3.5 and 5 h weekly corresponds to two to three matches per week which may be considered as a regular practice but not at as much as professional players. Unfortunately, the only study analyzing professional players[13] does not report a mean weekly time spent playing padel. Muñoz *et al.*,[5] identified that greatest time spent playing padel, greater the occurrence of injuries. In our sample, the odds of occurring an injury were much higher in the 3.5-5-hour group compared to the above 5-hour group. However, it does not appear that those playing more than 5 hours weekly had a higher frequency of participating in specific training regimes compared to those spending less time playing padel. Another study that has evaluated the risk factors in padel is that by Priego Quesada *et al.*[6] In this investigation, authors did not find increased injury neither for intrinsic factors nor for racket characteristics or playing volume. However, it has been observed that players who wore specific padel shoes were more prone to get injured. Considering the findings of the latter article,[6] we included a specific question for shoes use within our questionnaire. However, we did not find a significant difference among respondents between injured and non-injured padel players according to the shoes worn. However, despite not being significant, the odds of getting injured were higher in those who declared to use specific shoes. The only investigation that has identified intrinsic risk factors is that by Castillo-Lozano *et al.*[12] who identified age, BMI, and players laterality as potential risk factors. Greater age, BMI, and being right laterality were deemed to increase the risk of injury. In our sample none of these factors were detected as factors to increase the risk of injury. However, it should be considered that in the study by Castillo-Lozano *et al.*[12] were recruited only senior (55-67 years) and junior players (14-20 years), while our study included players from 18 years of age, with the majority of these being between 36 and 55 years, age range not examined by Castillo-Lozano *et al.*[12] As for tennis risk factors, playing volume, racket characteristics, biomechanics,[24] as well as characteristics of surface court[25] seem to influence injury occurrence. Padel is generally played on synthetic surfaces,[26] therefore this intrinsic factor cannot lead to variability in the incidence of injuries, as instead observed in tennis depending on the surface of the court. However, similar to tennis, it appears that racket characteristics and playing volume are factors to consider. Concerning biomechanical variables, since a very limited number of studies are available for padel, although plausible, it is premature to deduce that these can influence injury occurrence. As a matter of fact, literature concerning risk factors in padel is very limited and heterogeneous. Moreover, further studies from different geographical areas are needed to confirm padel risk factors.

Limitations of the study

Limitations of this study are that all data was collected through a customized self-administered questionnaire, therefore these may occur in self-reporting bias. Further limitation is that our questionnaire, as those present in previous similar investigations, is neither standardized nor validated. A strength of this study is that the administered questionnaire was created according to the recommendations for epidemiological studies in tennis[14] which is a first attempt to uniform to international guidelines. The most common sites of injury were the lower leg/Achilles tendon and the elbow. The most common types of injuries were tendinopathies and contusions. As far as risk factors are concerned, the equipment used, and the time dedicated to the sport determine an increase in the probability of an injury occurring. Preventive exercises and training programs should be carried out by players, coaches and instructors in order to reduce the number of injuries. Further, the knowledge regarding extrinsic risk factors can contribute promoting the use of more appropriate equipment.

Conclusions

Our study detected that in a sample of 127 Italian recreational padel players, 100 occurred an injury during the last year which caused absence from padel from 8 to 28 days. The most common injury locations were the lower leg/Achilles tendon and the elbow. The most common injury typologies were tendinopathies and contusions. Concerning the risk factors, the amount of time playing padel

(3.5-5 hours/week), racket type (round), and racket weight (either not knowing or 356-375 g) resulted in an increase in the probability of occurring an injury. Our results are usefull for coaches and sports professionals for identifying preventive strategies to reduce the risk of injury. These may imply improvement of athletic performance or preventive exercises to administer in those areas more subject to injury and to use adequate equipment.

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Conflicts of interest

The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

Authors' contributions

Ewan Thomas, Valerio Giustino and Antonino Bianco have given substantial contributions to study conception, Ewan Thomas and Antonino Bianco to study design, data analysis, and manuscript writing, Emanuele Ferrisi to data investigation, Antonino Bianco to data curation, Massimo Cassarino and Patrik Drid to manuscript writing, revision and editing, Antonino Bianco to study supervision. All authors read and approved the final version of the manuscript.

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