Original Research

Syndesmosis injuries in professional rugby players: associated injuries and complications can lead to an unpredictable time to return to play☆

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ABSTRACT

Objectives: Syndesmosis injuries are common and increasing in contact sports with a marked impact on players and teams alike. They can result in an unpredictable and often prolonged return to pre-injury level. We aim to evaluate the time to return to play (RTP) after syndesmosis injuries in professional male rugby players.

Methods: A cohort study including all professional rugby players with syndesmosis injuries, treatedboth operationally and non-operatively by the senior author was performed. The follow up period was a minimum of 12 months or until RTP. Players with previous ankle injuries or associated ankle fractures were excluded. Outcome measures included players age, body mass index (BMI), field position, seven-a-side or 15-a-side match, mechanism of injury, clinical findings, radiological findings, return to training (RTT), and RTP dates.

Results: For the period July 2015 to July 2019, a total of 13 professional male rugby players were included in the study. The leading mechanism of syndesmosis injury was in contact during a tackle. Six players had a grade 3 injury (40%), 4 players had a grade 2B injury (27%), 2 players had a grade 2A injury (13%) and 3 players had a grade 1 injury (20%). Two of the aforementioned players presented with new contralateral syndesmosis injuries during the study period. The median time for RTT and RTP was 97 days (IQR: 36) and 112 days (IQR: 54), respectively. All players with syndesmosis injuries were able to return to play. No discrepancy was found between seven-a-side and 15-a-side players regarding injury mechanism, injury severity, and RTP.

Conclusion: Most syndesmosis injuries in professional rugby players are acquired during a tackle. These injuries are often unstable, requiring surgical intervention, with an unpredictable recovery period. Injury severity, surgical complications, delayed diagnosis, and associated injuries can prolong this period. The subtype of rugby (seven-a-side and 15-a-side) does not affect the injury severity or return to play.

Level of evidence: Level 4

What are the new findings?

- The leading mechanism of syndesmosis injuries was tackle.
- The majority of injuries sustained during rugby are unstable, requiring surgery.
- Time to return to play was unpredictable and often prolonged.
- No link was found between seven-a-side and 15-a-side players regarding injury mechanism and injury severity. There was no difference between the 2 groups regarding RTT and RTP.

Introduction

The syndesmosis is a fibrous joint connecting the tibia and fibula. It is crucial in maintaining the integrity and stability of the ankle joint. It consists of distinct components, including the anterior–inferior tibiofibular ligament (AITFL), posterior–inferior tibiofibular ligament (PIFIL), and Interosseous ligament (IOL). The deep portion of the deltoid ligament limits external rotation and translation of the talus, relative to the tibia [1,2]. These ligaments ensure stability between the fibula and talus and play an important role in resisting axial, rotational and...
translational forces. Syndesmosis injuries, also called high ankle sprains, result from high-energy mechanisms or contact sports. The incidence is reported to be between 1% and 18% of all ankle ligament injuries [3–6]. Isolated syndesmosis injuries are more common in athletes participating in boot-immobilized sports and contact sports with inherent high-intensity motion and swerving movements, predisposing them to acute syndesmosis injuries [7]. Previous studies indicated that syndesmosis injuries take a notably longer time to recover compared to lateral ankle sprains [8–10]. This significantly impacts the athletes and their teams due to a protracted recovery period [11]. A fundamental component of appropriate treatment for athletes with syndesmosis injuries is to determine when it is safe to return to sport and understanding the implications and sequelae if recovery is not complete. Furthermore, if not diagnosed timeously, prolonged rehabilitation and structural traumatic arthritic changes may occur [12].

Current treatment algorithms are based on plain radiographs, MRI findings, and clinical examination which include the external rotation stress test (ER), squeeze test (ST), and translation test [13]. The WestPoint classification, modified by Calder et al. (Table 1), describes three grades of syndesmosis injuries rated from 1 (least severe, stable) to 3 (most severe and unstable) [14]. Limited evidence exists on the specific management of these injuries based on their classification. A vague distinction is made between indications for operative and non-operative management, especially pertaining to grade 2 injuries without discernable diastasis and subtle instability [1,5,15,16]. Most clinicians choose a non-operative approach for stable injuries (2A and 1) and surgical fixation for unstable (2B and 3) injuries [17].

When considering duration to RTP, numerous studies have been conducted involving athletes from various sport types. This study, in contrast, examines a homogenous cohort of professional rugby players that presented with acute syndesmosis injuries, the treatment algorithm used, and time to RTP.

Methods

Patient selection

Consecutive professional rugby players that sustained an acute syndesmosis injury presenting to the senior author's practice between July 2015 and July 2019 were included. The Ethics review committee approved the study (HREC15/2020). Players from the national 15-a-side team, national seven-a-side team and Premier teams were seen on a referral-based system, from the national medical team. All participants sustained acute syndesmosis injuries that were diagnosed clinically and radiologically; all completed the minimum follow-up period of 12 months (Table 2). The injuries were classified according to the WestPoint classification, modified by Calder et al., based on clinical examination and MRI findings. Players with an associated ankle fracture were excluded (see Table 3).

The player’s age, BMI, field position, mechanism of injury, clinical findings, radiological findings, return-to-training (RTT), and RTP dates were collected. The mechanism of injury was classified as direct when another player fell on the injured players leg and indirect when the injury happened during a seven-a-side or 15-a-side match. RTT was defined as return to first field training and RTP as being cleared for match selection. All complications, as well as planned and unplanned revisions, were documented. Medical information including time to RTP and RTT was obtained from the team doctors and players, by telephonic interview. The information was based either on recall or medical records kept by the medical team. Recall bias was limited by comparing dates as reported by participants to the author during follow-up visits, with feedback letters received from the team doctors. A feedback letter included information regarding the progress of the player during the rehabilitation phase and the specific dates the player was able to return to training and play. The criteria for RTP were based on a rehabilitation program used by the senior author, which included the ability to perform: multiple single-leg hop test, pain-free jogging and a pain-free 20 m sprint set

Table 1

<table>
<thead>
<tr>
<th>Grade</th>
<th>ATFL</th>
<th>IOL</th>
<th>PITFL</th>
<th>Deltoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (Stable)</td>
<td>Partial injury</td>
<td>Intact</td>
<td>Intact</td>
<td>Intact</td>
</tr>
<tr>
<td>2A (Stable)</td>
<td>Ruptured</td>
<td>Partial injury</td>
<td>Intact</td>
<td>Intact</td>
</tr>
<tr>
<td>2B (Unstable)</td>
<td>Ruptured</td>
<td>Ruptured</td>
<td>Partial injury</td>
<td>Partial</td>
</tr>
<tr>
<td>3 (Unstable)</td>
<td>Ruptured</td>
<td>Ruptured</td>
<td>Ruptured</td>
<td>Ruptured</td>
</tr>
</tbody>
</table>

Anterior-inferior tibiofibular ligament (ATFL), interosseous ligament (IOL), posterior-inferior tibiofibular ligament (PITFL).

Table 2

<table>
<thead>
<tr>
<th>Age</th>
<th>BMI</th>
<th>Position</th>
<th>Injury mechanism</th>
<th>Foot position</th>
<th>WestPoint classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
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<td>Forward</td>
<td>Unknown</td>
<td>Unknown</td>
<td>3</td>
</tr>
<tr>
<td>20</td>
<td>24.1</td>
<td>Back</td>
<td>Tackle direct</td>
<td>ER</td>
<td>3</td>
</tr>
<tr>
<td>20–24</td>
<td>30.6</td>
<td>Forward</td>
<td>Tackle indirect</td>
<td>ER</td>
<td>3</td>
</tr>
<tr>
<td>20–25</td>
<td>26.9</td>
<td>Back</td>
<td>Tackle indirect</td>
<td>ER</td>
<td>3</td>
</tr>
<tr>
<td>20–25</td>
<td>28.5</td>
<td>Forward</td>
<td>Tackle indirect</td>
<td>ER</td>
<td>1</td>
</tr>
<tr>
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<td>24.1</td>
<td>Back</td>
<td>Tackle direct</td>
<td>ER</td>
<td>3</td>
</tr>
<tr>
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<td>26.5</td>
<td>Back</td>
<td>Tackle direct</td>
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<td>3</td>
</tr>
<tr>
<td>20–25</td>
<td>29.2</td>
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<td>Tackle direct</td>
<td>ER</td>
<td>2B</td>
</tr>
<tr>
<td>20–25</td>
<td>28.1</td>
<td>Back</td>
<td>Tackle direct</td>
<td>ER</td>
<td>2B</td>
</tr>
<tr>
<td>20–25</td>
<td>30.1</td>
<td>Back</td>
<td>Tackle direct</td>
<td>ER</td>
<td>2B</td>
</tr>
<tr>
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<td>25.8</td>
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<td>Tackle indirect</td>
<td>ER</td>
<td>2B</td>
</tr>
<tr>
<td>26–30</td>
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<td>Back</td>
<td>Tackle direct</td>
<td>ER</td>
<td>2A</td>
</tr>
<tr>
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<td>28.6</td>
<td>Forward</td>
<td>Unknown</td>
<td>Unknown</td>
<td>2A</td>
</tr>
<tr>
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<td>27.4</td>
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<td>Unknown</td>
<td>1</td>
</tr>
<tr>
<td>26–30</td>
<td>34.1</td>
<td>Forward</td>
<td>Tackle indirect</td>
<td>ER</td>
<td>1</td>
</tr>
</tbody>
</table>

Anterior-inferior tibiofibular ligament (ATFL), interosseous ligament (IOL), posterior-inferior tibiofibular ligament (PITFL), negative (–).

Table 3

<table>
<thead>
<tr>
<th>Clinical palpation tenderness</th>
<th>Clinical tests</th>
<th>MRI findings</th>
<th>WestPoint classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATFL, IOL and deltoid</td>
<td>ST</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>3</td>
</tr>
<tr>
<td>ATFL, IOL and deltoid</td>
<td>ER</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>3</td>
</tr>
<tr>
<td>ATFL (10 cm proximal), IOL and deltoid</td>
<td>ST</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>3</td>
</tr>
<tr>
<td>ATFL (6 cm proximal), IOL and deltoid</td>
<td>ER</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>3</td>
</tr>
<tr>
<td>ATFL (10 cm proximal), IOL and deltoid</td>
<td>ST</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>3</td>
</tr>
<tr>
<td>ATFL (6 cm proximal), IOL</td>
<td>ER</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>3</td>
</tr>
<tr>
<td>ATFL (10 cm proximal), IOL</td>
<td>ST</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>2b</td>
</tr>
<tr>
<td>ATFL (6 cm proximal), IOL</td>
<td>ER</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>2b</td>
</tr>
<tr>
<td>ATFL (10 cm proximal), IOL</td>
<td>ST</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>2b</td>
</tr>
<tr>
<td>ATFL (6 cm proximal), IOL</td>
<td>ER</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>2b</td>
</tr>
<tr>
<td>ATFL, IOL</td>
<td>ST-ER</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>2b</td>
</tr>
<tr>
<td>ATFL, IOL</td>
<td>ER</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>2b</td>
</tr>
<tr>
<td>ATFL, IOL</td>
<td>ST-ER</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>2a</td>
</tr>
<tr>
<td>ATFL, IOL</td>
<td>ST-ER</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>2a</td>
</tr>
<tr>
<td>ATFL (3 cm)</td>
<td>ST-ER</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>2a</td>
</tr>
<tr>
<td>ATFL (3 cm)</td>
<td>ST-ER</td>
<td>Complete ATFL, IOL, partial deltoid</td>
<td>2a</td>
</tr>
</tbody>
</table>

Anterior-inferior tibiofibular ligament (ATFL), interosseous ligament (IOL), squeeze test (ST), positive (+), external rotation test (ER), posterior-inferior tibiofibular ligament (PITFL), negative (–).
Treatment algorithm

All players were clinically assessed by the senior author at five to 10 days post-injury. Twelve cases had weight bearing radiographs and all had an MRI done, followed by grading of the injury according to the WestPoint classification, modified by Calder et al. Clinical examination consisted of palpation over the individual ligaments, documenting tenderness, and specific tests including, external rotation stress test (ER) and squeeze test (ST).

An unstable syndesmosis injury was diagnosed if the following features were present: positive ER stress test and positive ST, tenderness along the anterior interosseous membrane > 6 cm proximal to the ankle, deltoid ligament - or PITFL injury on MRI, and/or suspicion of widened syndesmosis on X-ray [18]. Players with a stable syndesmosis injury were treated non-operatively and patients with an unstable syndesmosis injury were offered surgery (see Fig. 1).

Non-operative management

Non-operative management included an air cast pneumatic CAM walker for six weeks. The first two weeks were non-weight bearing; followed by progressive weight bearing, if the patient was pain-free. During functional rehabilitation, deep dorsiflexion and eversion were avoided, to minimize stress on the AITFL and deltoid ligament. After removal of the CAM walker, taping of the ankle was encouraged for a further 6 weeks during rehabilitation. All patients were counselled on the risk of anterior impingement, that may require surgery in the future.

Operative management

All patients had an examination under anaesthesia, documenting any sagittal or coronal instability of the fibula and comparing it to the contralateral side. After draping, a standard non-traction arthroscopy with a 4 mm lens was performed to evaluate the ankle joint for associated chondral injuries and to observe the syndesmosis. Syndesmosis instability was confirmed if the 4.5 mm shaver could fit in-between the tibia and fibula, or if movement in the sagittal plane exceeded 4 mm.

Unstable injuries were reduced anatomically and stabilised using the TightRope® device (Arthrex, Naples, FL). The TightRope® device was placed 1.5–2 cm above the joint line. The guide wire followed by the drill, was placed at an angle of 30° anteriorly and parallel to the joint line. If the medial button did not sit flush with the bone, another incision was made to place it under direct vision. A second TightRope® was only placed if ongoing instability was found, following the above fixation method. Reduction and compression of the syndesmosis was done by the assistant's hands, while the senior author placed the TightRope®. For the first two weeks post-operatively, patients were limited to non-weight bearing in a cast. During the following four weeks, weight bearing as tolerated in an air cast pneumatic CAM walker was allowed. Ankle exercises to regain motion was started two weeks post-operatively, followed by proprioceptive and strength training at four weeks. Impact exercises commenced from six weeks onwards.

Fig. 1. Treatment algorithm based on the WestPoint classification modified by Calder et al. Squeeze test (ST), external rotation (ER), anterior–inferior tibiofibular ligament (AITFL), interosseous ligament (IOL), posterior–inferior tibiofibular ligament (PITFL), examination under anaesthesia (EUA), non-weight bearing (NWB), full weight bearing (FWB).
**Statistical analysis**

The RTT and RTP days were grouped according to their modes of treatment (operative vs non-operative). Two tailed Mann–Whitney U test of significance was performed between the groups. Spearman rank correlation coefficient was calculated among all the measured variables to investigate linear associations. The level of significance was set at \( p < 0.05 \) and the correlation levels were explained according to Mukaka et al. [19] All the statistical analyses were performed in IBM SPSS v.26

**Results**

A total of 18 consecutive professional rugby players with syndesmosis injuries were treated. Five players were excluded: two sustained concomitant fibular fractures, two sustained ATFL injuries not involving a significant part of the syndesmosis, and one player had simultaneous hallux valgus correction at the time of syndesmosis repair. Of the 13 remaining players, two presented with new contralateral syndesmosis injuries during the study period; they were treated as separate cases, bringing the cohort to 13 players with 15 syndesmosis injuries. The contralateral injuries occurred 18 months and 16 months, respectively, following the initial event. The cohort consisted of two national 15-a-side players, nine national seven-a-side players and two premier players.

The median age of players were 24.0 years (IQR: 6). The median age of players with unstable injuries were 23.5 (IQR: 4.5) and those with stable injuries were 27 (IQR: 4). Front row players accounted for five injuries and 10 injuries occurred in back row players. The median BMI was 28.5 (IQR: 2.7) (Table 2). Eight injuries were in seven-a-side and seven in 15-a-side players. No discrepancy was found between seven-a-side and 15-a-side players regarding injury mechanism and injury severity. There was also no difference between the two groups regarding RTT and RTP.

The mechanisms of injury included direct tackle (47%), indirect tackle (33%), and unknown mechanism (20%). Based on MRI and clinical examination, 40% of all injuries were grade 3 (n = 6), followed by grade 2B (n = 4; 27%), grade 2A (n = 2; 13%), and grade 1 (n = 3; 20%) (n = 10) Were unstable injuries and 33% (n = 5) stable.

One player had an associated small avulsion fracture of the posterior malleolus and one player sustained an osteochondral lesion measuring 5 × 5 mm.

Four players were treated non-operatively and 11 players underwent surgery. One complication occurred; a partial injury to the common peroneal nerve, following a popliteal block. This patient experienced numbness in the deep and superficial peroneal nerve distribution. There was no associated motor weakness and the numbness resolved by 16 weeks post-surgery.

**Return to training and play**

The total median RTT was 97 days (IQR: 36) and the total median RTP was 112 days (IQR: 54). In the non-operative group, the median RTT and RTP was 50.5 days (IQR: 123.75) and 58.5 days (IQR: 123), respectively. In the operative group, the median RTT was 105 (IQR: 22) and the median RTP was 120 days (IQR: 40) (Fig. 2). Two players had a prolonged time to RTT and RTP compared to the other participants, despite initial low-grade injuries. The first player sustained an initial grade 2A injury and a 5 × 5mm acute osteochondral lesion with significant bone oedema; it was treated with microfracture surgery only. However, further surgery was indicated nine months later due to anterior impingement and ongoing instability was found intra-operatively. An arthroscopic debridement and placement of a TightRope® device was performed. The time to RTT and RTP was 41 and 49 days, respectively. The second player sustained a grade 1 injury, but developed ongoing anterior ankle pain preventing him from returning to play. A follow-up MRI showed a thickened but stable ATFL and the symptoms resolved after an ultrasound-guided steroid injection. His time to RTT and RTP was 195 and 201 days, respectively (see Fig. 3).

**Discussion**

**RTT and RTP**

The most important findings of this study are that players with an unstable syndesmosis injury had a prolonged median RTT and RTP of 105 and 120 days, respectively. RTT and RTP days are important in evaluating the outcomes of syndesmosis injuries. Stable syndesmosis injuries treated non-operatively in this cohort had RTT and RTP days of 50.5 and 58.5, respectively. In the unstable group treated operatively, the RTT and RTP was unpredictable and prolonged. In a prospective cohort study, Calder et al. looked at 64 athletes with grade 2 injuries. An average RTP for grade 2A injuries (stable) was found to be 45 days (23–63 days) and grade 2B injuries (unstable), 65 days (range 27–104 days). This study covered a variety of athletic sports, but excluded athletes with grade 3 injuries [18]. In contrast, our study included only professional rugby players, all with injuries ranging from grades 1 to 3. A long-term prospective cohort study, including 3677 male professional football players, found an average RTP of 39 ± 28 days, but did not record the clinical
examination findings [7]. Another study looking at intercollegiate athletes found similar early RTP; however, diagnoses were made solely on plain radiographs, failing to mention injury to the deltoid ligament or the length of syndesmosis tenderness; subsequently suggesting that certain injuries might have been less severe [7,20].

A study looking only at unstable injuries in 110 professional football players, found RTT and RTP of 72 ± 28 and 103 ± 28 days, respectively. Multivariate analysis showed that injury severity, the presence of talar cartilage injury, and younger age were significant predictors of a prolonged RTT and RTP [17]. Literature therefore seem to vary in the quoted return dates of players, which highlights the often unpredictable and prolonged return to sport in these injuries.

**Injury mechanism and injury severity**

The majority of syndesmosis injuries sustained (67%), were unstable (grade 2b and 3), requiring surgical stabilization. Greater severity of injuries was observed in the younger age group, compared to older players. Younger age at the time of surgery was shown to be associated with longer recovery times [17,21]. Furthermore, including younger, less experienced players with initial suboptimal conditioning in a team, could predispose them to a higher risk of sustaining injuries [22,23]. The most common position of the limb during injury is hip flexion, knee flexion, knee valgus, ankle dorsiflexion, foot pronation, and external rotation [24]. The majority of injuries (73%) were sustained during a tackle (direct and indirect), which highlights the uniqueness of rugby as a risk factor for these injuries. One group reviewed the video footage of 13 professional rugby players who sustained acute injuries over a period of 5 seasons. The majority (69%) of injuries were unstable, requiring surgery. Regarding the mechanism, 54% were sustained while tackling the opposition and 46% while being tackled. The authors concluded that poor tackle techniques were often implicated in the mechanism of injury [25]. This finding could explain why younger players, being relatively less experienced, could be at an increased risk.

**Lack of definition**

Published studies show varied results regarding time to return to play (Supplemental Material Table 2), with no clear definition or use of standardized terminology. This is confirmed in current literature, which suggests the need for a standardized definition and criteria for RTP and related terminology. Whether RTP means the same as return to preinjury level is unclear [9,16,18,26]. In our cohort, all players returned to their pre-injury level, which is consistent with findings of the systematic review done by van Vancolen et al. [16] There appears to be a lack of high-quality studies regarding the time to RTP after syndesmosis injuries. Most literature underestimates the duration, either due to inclusion of largely low-grade injuries or heterogenous athletic injuries. Further sport specific studies are required to observe injury related time to RTP. To our knowledge, this study is one of few that highlights the true nature and impact of syndesmosis injuries in professional rugby players. This may help guide both treating clinicians and players, revealing that it may not be a benign injury in many circumstances, therefore causing prolonged return to the rugby field.

**Strengths and limitations**

Our study cohort is relatively small; however, it includes a homogenous group of professional rugby players. Both operatively treated and non-operatively treated patients were included, which makes comparison between these two groups possible. The retrospective nature of the study could lead to recall bias in the RTT and RTP dates. Re-operations were not excluded which in a single study could lead to recall bias in the RTT and RTP dates. Future studies may elucidate discrepancies.

**Conclusion**

Most syndesmosis injuries in professional rugby players are acquired during a tackle. These injuries are often unstable, requiring surgical intervention, with an unpredictable recovery period. Injury severity, surgical complications, delayed diagnosis, and associated injuries can prolong this period. The subtype of rugby (seven-a-side and 15-a-side) does not affect the injury severity or return to play.
Appendix A. Supplementary data

Acknowledgments

The authors confirm that all authors have made substantial contributions to all of the following:
1) The conception and design of the study, or acquisition of data, or analysis and interpretation of data.
2) The drafting of the article or its critical revision for important intellectual content.
3) Final approval of the version to be submitted.
4) Sound scientific research practice

The authors further confirm that:
1) The manuscript, including related data, figures and tables has not been previously published and is not under consideration elsewhere.
2) No data have been fabricated or manipulated (including images) to support conclusions.
3) This submission does not represent part of a single study that has been split up into several parts to increase the quantity of submissions and submitted to various journals or to one journal over time (e.g., “salami-publishing”).
4) No funding was received for this study.

Contributors

1) No data, text or theories by others are presented as if they were the authors' own.
2) Proper acknowledgements of others' work have been given (this includes material that is closely copied, summarized and/or paraphrased); quotation marks are used for verbatim copying of material.
3) Permissions have been secured for material that is copyrighted.

Funding

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jisako.2022.03.001.

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