Injury 53 (2022) 2304–2310

Contents lists available at ScienceDirect

Injury

journal homepage: www.elsevier.com/locate/injury

The Australian ankle syndesmosis injury survey

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ARTICLE INFO

Article history:
Accepted 5 February 2022

Keywords:
Ankle syndesmosis
Suture-button
Syndesmosis Screws
Survey

ABSTRACT

Background & Objective: The ankle syndesmosis is frequently disrupted in ankle injuries, with higher incidence in concomitant ankle fractures. There is debate regarding the most appropriate surgical management of these injuries, with the development of suture-button devices challenging the conventional approach of surgical stabilisation with syndesmotic screws. The primary aim of this study was to assess current practice variation at a national level, enabling a comparison with reported practice around the world. The secondary aims were to assess practice variation between operative indications and inconsistencies between surgeon device usage and personal preference should they be injured themselves.
Methods: A 20-item survey detailing surgical experience, diagnosis, surgical management preference and a series of case studies was conducted. The survey was endorsed and promoted by the Australian Orthopaedic Association (AOA).
Results: 125 responses were received during the three-month study period. The most commonly used method to stabilise a syndesmotic injury by Australian orthopaedic surgeons was two 3.5 mm screws (26.4%), closely followed by one suture-button (23.2%). Overall, 44% of surgeons employ a dynamic stabilisation method and 54.4% a static stabilisation method. Half of surgeons recommend routine removal of syndesmosis screws, and surgeons tend to use two devices for high Weber C fractures. One third of surgeons who most commonly use screws in their practice would actually prefer a suture-button for management of their own syndesmosis injury.
Conclusion: Significant variability remains in the management of syndesmosis injuries. This survey of Australian orthopaedic surgeons reveals higher suture-button device use when compared to other countries.

Introduction

Ankle injuries, regardless of an associated fracture, are common injuries in both the athletic and general populations [1]. The ankle syndesmosis, a construct of four ligaments and interosseous membrane at the distal tibiofibular joint, provides stabilisation and forms a mortise for articulation of the talus and tibia [2,3]. It is estimated that 13% of all ankle fractures, and 20% of ankle fractures requiring operative management, are associated with a syndesmosis injury [4]. Functional limitation from instability, and chronic pain secondary to joint degeneration, are potential long-term sequelae of ankle syndesmosis injuries [2,5], emphasising the necessity for appropriate diagnosis and management.

A number of provocative tests have been developed to identify syndesmosis injuries, including the lateral stress and external rotation stress tests. In isolated use, these tests have poor diagnostic sensitivity, and in the setting of associated fracture, limited clinical utility [6]. This may be due to their inaptitude in reliable assessment of sagittal plane instability, with Candal-Couto et al. [7] suggesting that distal tibio-fibular instability should be assessed in the sagittal, rather than coronal, plane. Weight bearing radiographs are a key investigative tool in the diagnosis of ankle syndesmosis injuries, yet their sensitivity in this setting is poor, estimated at 53% [8]. Anatomical variability, age and gender specific effects all contribute to this low sensitivity, with Prakash et al. [9] suggesting that current radiological criteria require modification. Currently, there is no definitive gold standard in diagnosis, however, Magnetic Resonance Imaging (MRI) and direct visualisation with ankle arthroscopy have high diagnostic accuracy [8,10]. Overall, the accurate diagnosis of ankle syndesmosis injuries relies on the combination of clinical examination, preoperative imaging and intra-

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https://doi.org/10.1016/j.injury.2022.02.024
0020-1383/

operative assessment, with a healthy respect for the limitations of each.

While conventional surgical stabilisation of the ankle syndesmosis has been achieved with syndesmotic screws, alternative methods include the use of dynamic stabilisation systems with suture-button devices. Suture-buttons employ a non-absorbable braided composite suture that is anchored with a cortical metal button, providing stability while potentially improving range of movement [11]. A number of randomised controlled trials have been conducted to ascertain if one method is superior in patient outcomes, with multiple systematic reviews published in recent years [12–18]. These studies have failed to elicit a common and conclusive recommendation when comparing static and dynamic stabilisation methods. Onggo et al. [12] suggest that both methods yield similar clinical results, however fewer implant failures are seen with suture-button devices. Mckenzie et al. [16], Xie et al. [17] and Inge et al. [13] all appear to favour suture-button use – reporting fewer reoperation rates and complications, better American Orthopaedic Foot and Ankle Society (AOFAS) scores and lower incidence of malreduction.

Within static stabilisation methods, variation in practice exists with regard to the number of screws used, the number of cortices engaged, timing of screw removal and recommended functional limitations during the rehabilitation process [19–22]. Cadaveric studies comparing 3.5 mm and 4.5 mm screws for syndesmosis fixation have failed to identify a superior screw size [23]. A single screw may fail under less load when compared to two screws [24], however this cannot be extrapolated to any appreciable clinical difference in outcome [25]. Given some physiological movement is required at the distal tibio-fibular syndesmosis, it remains uncertain if a firmer construct is clinically desirable. Similarly, there has been no proven benefit for either tricortical or quadricortical fixation from both cadaveric [23] and clinical studies [25]. Finally, there is no definitive evidence to support routine screw removal, and cost effectiveness/infection exposure risk must be considered [26]. While the relative cost of suture-button devices remains a concern, Ramsey and Friess [27] determined that, when compared with symptomatic screw removal rates of greater than 17.5%, suture-buttons were more cost-effective.

The primary aim of this study was to assess current practice variation in Australia, and enable a comparison with reported practice around the world. The secondary aims were to assess practice variation between operative indications, and inconsistencies between surgeon device usage and personal preference should they be injured themselves.

Methods

A 20-item survey was created and distributed using REDCap [Nashville, Tennessee, USA]. The survey was designed with the assistance of two local orthopaedic consultant surgeons to ensure the information gathered was of high clinical utility and to allow direct comparison with previously conducted surveys in other countries [19–22]. Questions were broadly divided into 3 subsections: surgical background, diagnosis/management and case studies. A full list of survey questions in listed in Appendix A. Following local ethics approval, an application was submitted to the Australian Orthopaedic Association (AOA) Research Review Advisory Panel for consideration. With AOA endorsement, the survey was advertised on the AOA website and monthly newsletter for a duration of 3 months. The survey was also distributed to members of the Australian Orthopaedic Foot and Ankle Society (AOFAS) and the Australian Orthopaedic Trauma Society (AOTS) via email. Statistical analysis was performed utilising GraphPad Prism version 9 [San Diego, California, USA]. Contingency table analysis was conducted using Fisher's exact test, with a two-sided p value of < 0.05 regarded as statistically significant.

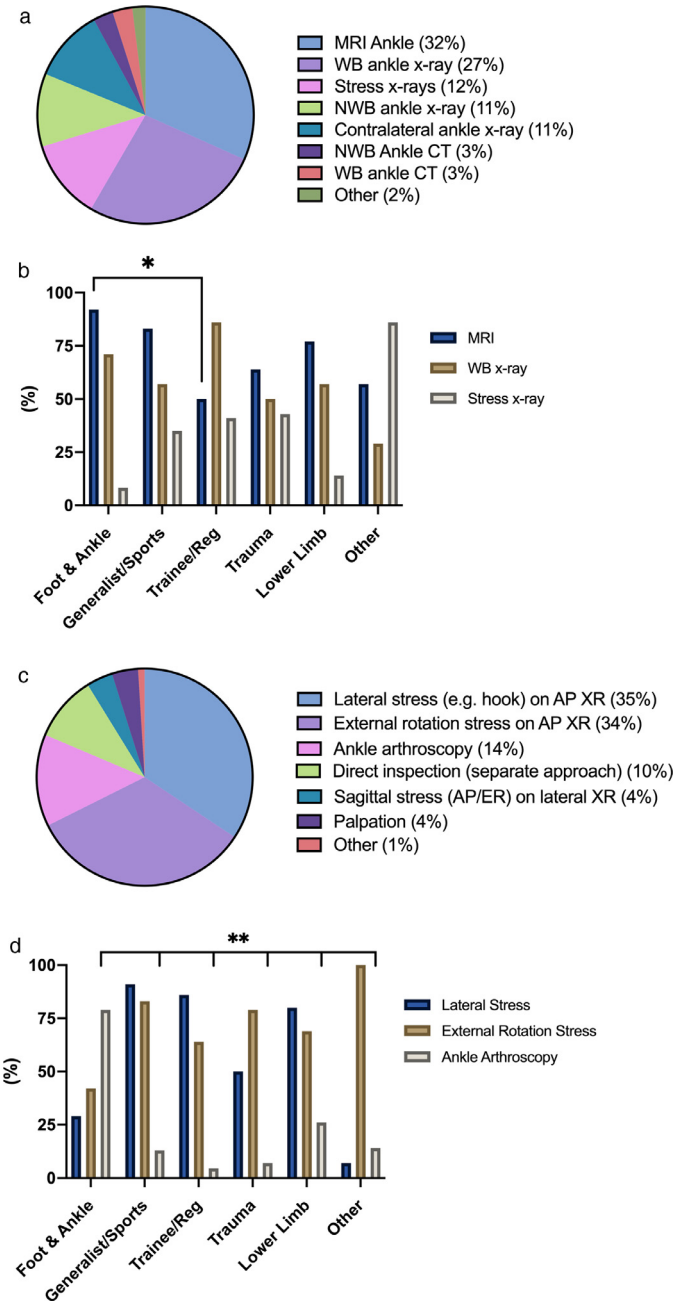

Fig. 1. Routinely employed preoperative imaging for suspected ankle syndesmosis injury (without fracture) (a) and spread based on self-identified sub-speciality (b). Intraoperative assessment used to confirm the diagnosis (c) and spread based on self-identified sub-speciality (d). * denotes $p < 0.05$. ** denotes $p < 0.001$.

Results

A total of 125 completed responses were received during the three-month study period (September – November 2020). The highest response rate was from self-identified Lower Limb surgeons (28%), followed by Foot & Ankle surgeons (19.2%). Survey respondent demographic data is summarised in Table 1. Fig. 1 illustrates surgeons' preference for diagnosis of isolated injuries without fracture, with a preference for MRI or weightbearing plain radiographs. Self-identified Foot & Ankle are statistically more likely

Table 1
Survey respondent demographics.

How would you describe your current speciality/subspecialty practice?	(n)	%
Foot & Ankle	24	19.2
Generalist/Sports	23	18.4
Lower Limb	35	28.0
Trainee/Registrar	22	17.6
Trauma	14	11.2
Other	7	5.6
How many ankle injuries (fractures or isolated syndesmotic injuries) would you surgically treat in the average year?	**(n)**	**%**
0–10	25	20.0
11–30	69	55.2
>30	31	24.8
How many years have you been a practicing orthopaedic surgeon?	**(n)**	**%**
< 5 years	34	27.2
5–10 years	25	20.0
> 10 years	66	52.8

Table 2
Surgical management of ankle syndesmosis injuries.

In your current practice, which method do you most commonly use to stabilise a syndesmotic injury?	(n)	%
One 3.5 mm screw	9	7.2
One 4.5 mm screw	17	13.6
One suture-button device	29	23.2
Two 3.5 mm screws	33	26.4
Two 4.5 mm screws	9	7.2
Two suture-button devices	26	20.8
One screw and one suture-button	1	0.8
Other	1	0.8
If using the screw(s), how many cortices do you aim to engage with each screw?	**(n)**	**%**
3	62	49.6
4	51	40.8
N/A (do not use screws)	12	9.6
If using screw fixation, which of the following do you recommend?	**(n)**	**%**
Removal of screws	66	52.8
Retention of screws	29	23.2
I let the patient decide	20	16
N/A (I do not use syndesmotic screws)	10	8
If removing syndesmotic screws, when do you remove them?	**(n)**	**%**
6 weeks	6	4.8
3 months	77	61.6
4–6 months	18	14.4
> 6 months	3	2.4
N/A: not removed / not used	21	16.8
If you remove syndesmotic screws what post-operative restrictions do you recommend once the wound has healed?	**(n)**	**%**
I restrict impact sport for < 6 weeks	26	20.8
I restrict impact sport for > 6 weeks	17	13.6
Nil - return to activity as tolerated	64	51.2
N/A: not removed / not used	18	14.4

to utilise ankle arthroscopy to assist in the diagnosis of syndesmosis injury ($p < 0.001$).

The most common method used to stabilise a syndesmotic injury by Australian orthopaedic surgeons is two 3.5 mm screws (26.4%), closely followed by one suture-button (23.2%) (Table 2). Foot & Ankle surgeons are statistically more likely to use suture-buttons when compared to their colleagues ($p = 0.037$). Lower limb surgeons are more likely to use screws ($p = 0.043$). Years of operative experience (<5 vs. >10) and number of injuries managed per year (<10 vs. >30) did not influence surgical preference for screw or suture-button ($p = 0.289$ and 0.282, respectively).

To further investigate surgeon preference for static or dynamic stabilisation methods, respondents were presented with a series of case studies (Fig. 2). These show that younger patients with higher functional demands are more likely to be managed with a suture-button when compared to a sedentary 60-year-old. Additionally, if the fracture pattern shifted from a low to a high Weber C, patients are more likely to be managed with two constructs (two screws or two suture-buttons), regardless of age. Finally, when asked their preference in management of their own low Weber C fracture requiring plate and syndesmosis stabilisation (Fig. 3), 60% percent of respondents would prefer to have a suture-button over a screw.

Discussion

Our study provides a snapshot of current practice within the Australian orthopaedic surgical community with regard to the diagnosis and management of ankle syndesmosis injuries. The variation in practice is likely driven in part by the ongoing debate within the literature.

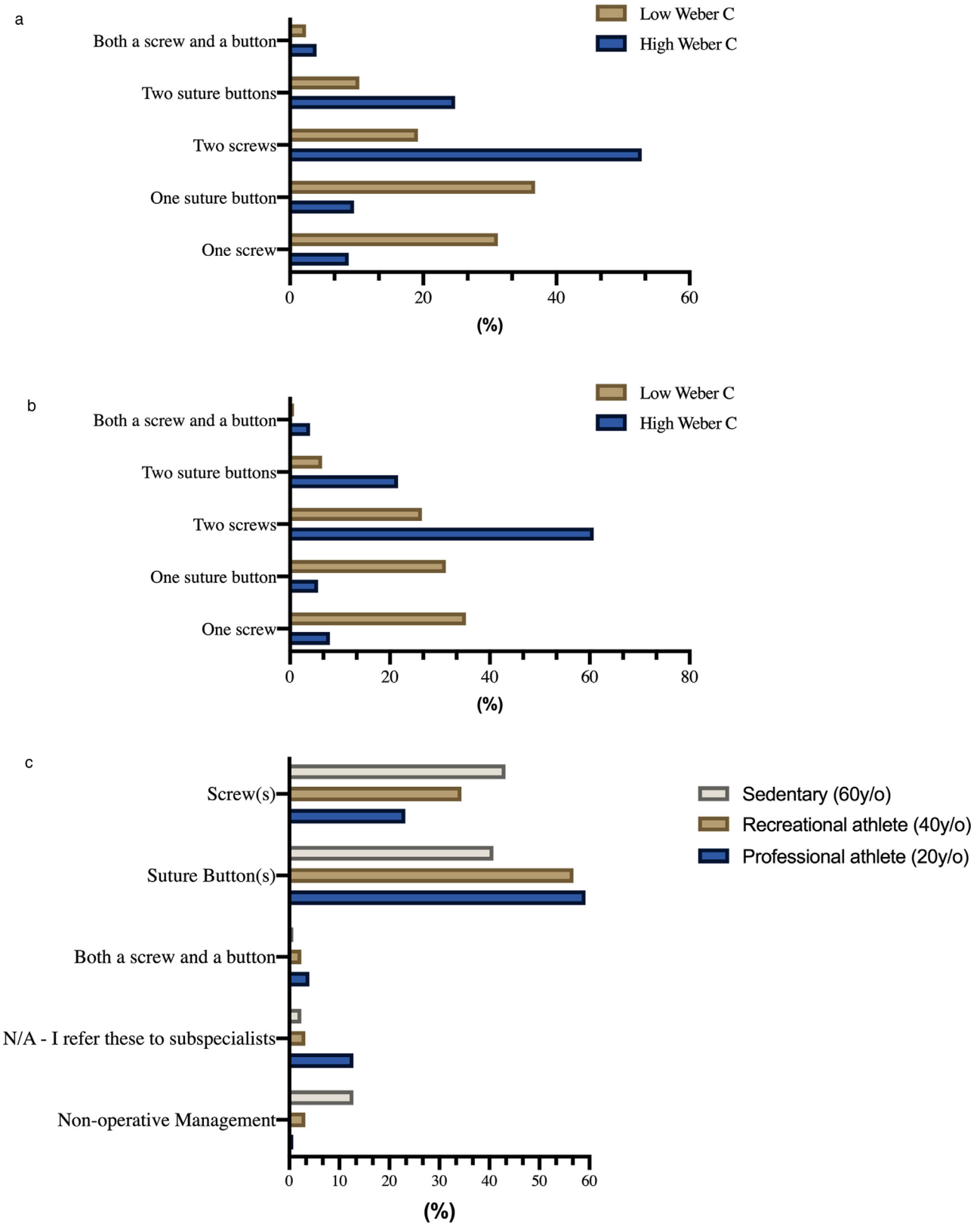

Fig. 2. Case Studies - management of ankle syndesmosis injuries based on age/fracture pattern (a = 20 year-old, b = 60 year-old) and functional activity level (c).

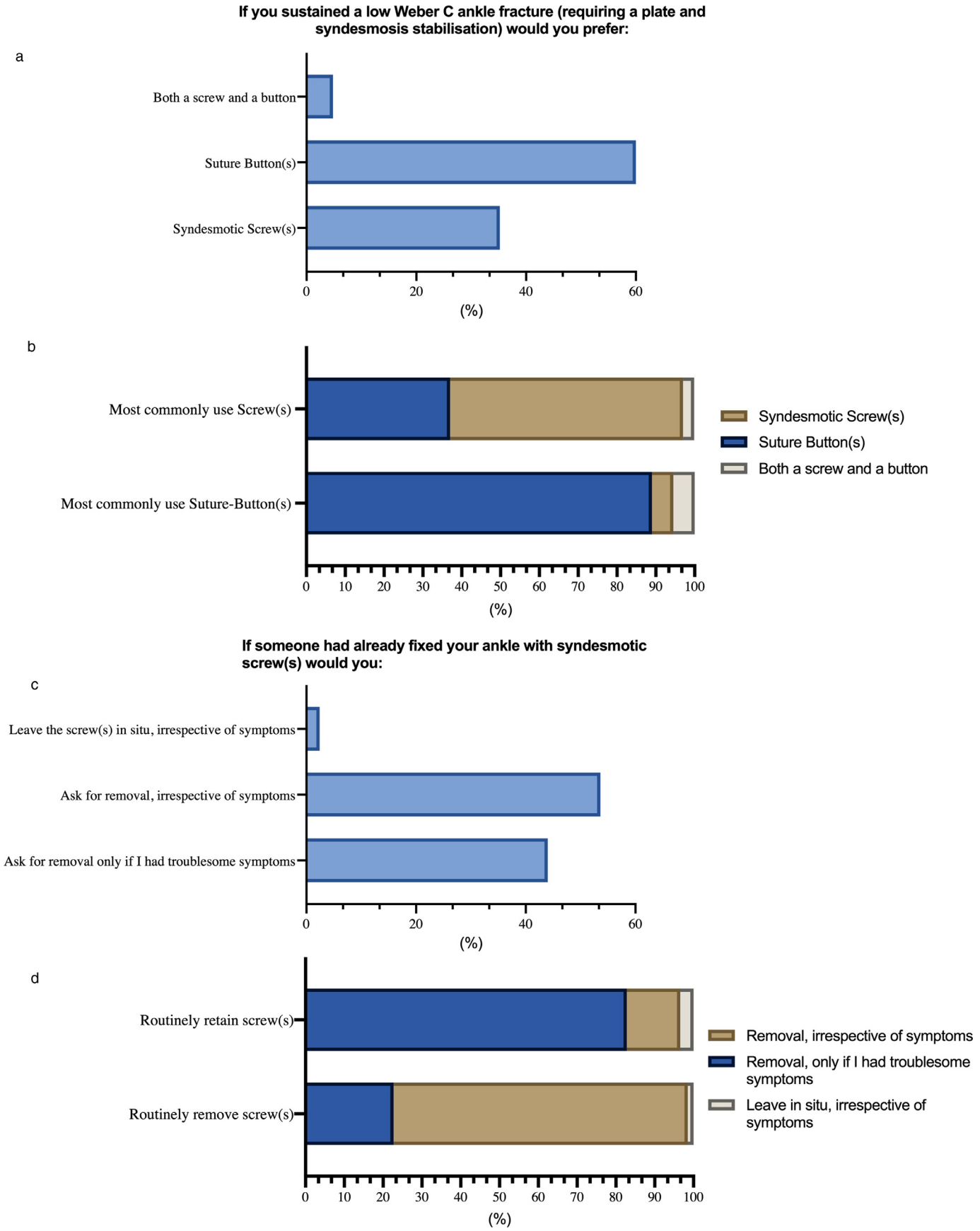

Fig. 3. Surgeon preference for management of their OWN ankle syndesmosis injury. Screw vs suture-button (a) and proportion based on their own self-reported practice (b). Surgeon preference for removal vs retaining of syndesmotic screws for their OWN ankle (c) and proportion based on their own self-reported practice (d).

Diagnosis

Our study shows that MRI is the most routinely employed preoperative investigation by Australian surgeons in the diagnosis of ankle syndesmosis injuries without associated fracture. In this context, MRI has a sensitivity of 96% [8], yet cost and access remain a barrier. The routine use of MRI was not assessed in previous surveys [19–22]. The broad range of confirmation studies and diagnostic techniques reported by orthopaedic surgeons emphasises the difficulty in the diagnosis of syndesmosis injuries. Similarly, the spread of results with regard to intraoperative assessment further reflects this challenge. Foot and Ankle surgeons likely have a greater familiarity with ankle arthroscopy and therefore more commonly use this additional assessment to aid the diagnosis.

Management

Based on our results, 44% of surgeons most commonly use one or more suture-button devices. This is well above the reported rate in previous surveys of American [19,20] and British [21] surgeons, at approximately 17% and 1.6% respectively, although it must be noted that the British survey was conducted when dynamic stabilisation methods were relatively new to market. Our results suggest that Foot & Ankle surgeons are more likely to use a suture-button device. This may reflect their patient population and familiarity with these devices, as 12.8% of survey respondents stated they would refer a 20-year-old professional athlete with an isolated syndesmosis injury to a subspecialist.

When focusing on syndesmotic screw use specifically, our results reflect ongoing variability in practice. This may be driven by the lack of a definitive advantage of one single method or combination [23,25]. The routine removal of syndesmotic screws remains controversial, with an lack of high quality evidence to support this practice [25,26]. Our results suggest that approximately half of surgeons recommend routine screw removal, a much lower number than their counterparts in the Netherlands (87%) [22]. With a reported screw removal rate well above the cost-analysis threshold of 17.5% proposed by Ramsey and Friess [27], we suggest that initial cost should not necessarily be a prohibitory factor against suture-button use.

The series of case studies in our study highlights the role of patient age, fracture pattern and functional status on surgeon preference for management options. Younger patients with higher functional demands are more likely to be managed with a suture-button device, presumably to achieve earlier postoperative weight bearing status and improved range of motion. The finding that high Weber C fractures, regardless of patient age, are more likely to be managed with two devices may reflect an attempt to limit the vertical instability associated with this fracture pattern, when compared to more distal fractures [3].

One of the aims of our study was to explore whether surgeons themselves would request the same treatments they prescribe. Interestingly, 33% of Australian surgeons who most commonly use screws would, in fact, prefer a suture-button for their own ankle. Perhaps this shows that Australian surgeons consider their functional activity level to be higher than the average patient they treat. It may also reflect the contribution of systemic issues, such as hospital policy and financial concerns. Finally, surgeons may have an unconscious bias in favour of suture-buttons which is not reflected in their own clinical practice.

This study is not without limitation. The cross-sectional, voluntary nature of the study design predisposes it to response bias. Additionally, the small number of responses may only reflect a proportion of the current practice in Australia. Despite these limitations, the even breadth of responses across the self-identified orthopaedic subspecialists and years of operative practice remain a strength of the study.

Conclusion

Our study has captured the current state of practice within Australia with regard to the diagnosis and management of ankle syndesmosis injuries. Overall, significant variability in practice exists, consistent with the findings of previous international studies. Despite this, the rate of suture-button use does appear to be increasing and, given the potential benefits, may continue to do so.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.injury.2022.02.024.

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