Osteochondral lesions of talus

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Osteochondral lesions of the talus (OLT) occur after acute injury or repeated trauma, and most are located on the medial talar dome. The incidence of OLT is increasing due to early diagnosis and better access to imaging. In a meta-analysis of 181 studies, the incidence of ankle sprain injuries was 13.6 per 1,000 exposures in females and 6.94 per 1,000 exposures in males.[1] Up to 70% of sprains and fractures involving the ankle are thought to result in osteochondral lesions.[2] OLT causes substantial ankle pain, reduced activity, and mechanical symptoms limiting activity. Untreated, OLT can lead to the development of osteoarthritis, considerable functional impairment, and morbidity. Functional results of ankle fractures treated surgically have been reported to be 'suboptimal' in up to 50% of cases at three years' follow-up, often due to persistent pain. Some have speculated that this pain could be due to untreated osteochondral lesions.[3]

One of the main challenges is to make a reliable diagnosis of OLT. Following a traumatic event or patient-reported pain and stiffness, the OLT can be observed on a radiograph and then confirmed with an MRI, but it is easy for the OLT to be misdiagnosed as a simple ankle sprain if the imaging is unclear or not performed.[4] It may be that in the future, artificial intelligence can improve reliability of diagnosis,[5] but such programs can only analyze what can be seen on a radiograph and scans, hence the type and quality of the imaging remain critical for making the correct diagnosis.[6] Having said that, specific location and the extent of the lesion may sometimes be difficult to assess with currently available imaging methods.

The aetiology of OLT is understood in part, with most cases linked with trauma, and this link seems to be stronger for lateral lesions.[6] However, the mechanics of the original injury can vary markedly; it may be from an acute injury or may be repetitive microtrauma occurring over an extended period. Imaging studies suggest that the substantial pain experienced by patients with OLT derives from damage to the underlying bone.[7] The location of the lesion may also be a factor in the biomechanics of the joint and the pain experienced by the patient.

There have been several studies which explore the biomechanics with a view to linking the forces experienced by the joint and OLT;[7] these have shown high cartilage stress in areas more likely to develop an OLT, as well as changes in the gait of those with OLT.[8] Anecdotal evidence and outcome scores have been indicative of altered joint function and gait, but very few studies have been conducted to explicitly assess gait biomechanics. This is partly due to the link between ankle sprain and ongoing ankle instability that interacts with the presence of OLT, making independent assessment of OLT-only related changes difficult to achieve. One such study has highlighted that patients with OLTs exhibit reduced flexion and rotation compared with healthy subjects during stair descent where range of motion negatively correlated with pain, suggesting adaptation that may be linked to joint degeneration and higher patient-reported pain.[9]

Cadaveric studies indicate that size and location of the defect also contribute to subsequent local tissue damage, suggesting that not all OLT will progress in the same manner; they also identified increased contact pressure in inversion compared with neutral position for medial lesions.[10,11] Such findings could provide insight into

biomechanical function and pain experience of the patient. A small number of computational finite element models have also been developed, typically simplifying the mechanical properties of the tissues, but providing useful insight into the effects of size and depth of the lesions. These may, in the future, prove to be a useful tool for predicting outcomes and modelling new interventions prior to translation into clinical use.[12]

The questions surrounding OLT do not need to be answered through clinical studies only, as demonstrated by the biomechanics research. The unanswered questions are multidisciplinary, and it is only through collaboration across fields that we will be able to see the whole picture. Given the link between loading and OLT, biomechanical studies can offer useful insight, and adoption of biplanar radiograph assessment and advanced imaging may be particularly beneficial in elucidating relationships between size, location of the lesion, and joint function. Furthermore, animal and in vitro models are required to understand the biological factors at play.[13] Basic cadaveric models have been developed to assess the stability of specific interventions in vitro, but at this time, the models use a simple form of biomechanical loading, and the complexity of model required to assess the functionality is not clear.[14] Tissue engineering and regenerative medicine methods could be critical to develop new surgical treatments.

As it stands, best treatment pathways for these patients are unclear and vary widely across the globe. In the main, non-surgical treatment for OLT has been shown to be unsuccessful.[15] Surgical treatment options include arthroscopic debridement and drilling to promote healing, but there is a notable variation between centres, and differences occur in both the chosen treatment and postoperative management. A worldwide survey performed between 2018 and 2019 brought this issue into focus, and highlighted that in some countries it is not possible for surgeons to adhere to published guidelines for economical and practical reasons.[16] Results from a similar survey have been published this year, capturing information from German-speaking surgeons, and findings were remarkably similar to the previous worldwide study.[17]

The uncertainty surrounding treatment of osteochondral lesions is not new. In 2012, the first International Congress on Cartilage Repair of the Ankle was held in Dublin, Ireland, with the goal of coming to a consensus on treatment. A key observation during this meeting was that treatment choice was often associated with training experience. Obtaining a consensus proved harder than initially thought, and it was not until 2017 that the group agreed on the guidelines which are currently used.[18] These guidelines, however, have seemingly not changed practice given the wide variation still being reported.

The main challenge which the group faced was the lack of data on which to base the guidelines,[19] and this may have led to reduced confidence in the recommendations. Several studies have reported that levels of evidence for clinical studies of OLT treatment are too low with small sample sizes.[17,18] In 2022, the James Lind Alliance methodology was used to identify the top ten research priorities in foot and ankle surgery,[20] and one of the key questions still to be answered was "What is the best surgery for bone and cartilage defects in the talus?". There is still a need for high-quality randomized controlled trials in this area.

Alongside the much-needed research into best practice, new treatment options for osteochondral lesions are being introduced and some older methods are gaining popularity: the annotation by Hurley et al[21] provides an excellent overview of the range of current treatments. Ongoing changes in practice may further complicate the picture, and it is critical that rigorous studies are performed as soon as possible to ensure that any guidelines remain up to date, useful, and fill the current knowledge gaps. For example, it is unclear at what defect size of OLT osteochondral autologous transplantation is most effective. Similarly, the importance of concomitant injury, how platelet-rich plasma or hyaluronic acid injection influences outcome, or what size of subchondral cyst requires bone grafting form some of the many unanswered questions.

There are still gaps in our knowledge surrounding OLT: how they originate, the mechanism of degenerative progression, how we can reliably and efficiently diagnose them, how we assess the effectiveness of new treatments rigorously, what the best treatment is, and how to ensure consistent, co-ordinated, and evidence-based treatment worldwide. The sparsity of research in this area needs to be remedied. Many of the research areas are fast-moving – for example, artificial intelligence tools are becoming increasingly multimodal, which could be the key to fast and reliable diagnosis. Future research needs to focus on improvement in current treatment methods, development of novel techniques, and defining core outcome set in the management of OLT.

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