Osteochondral Lesions of the Tibial Plafond

A Systematic Review

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Background: There is a paucity of data regarding osteochondral lesions of the tibial plafond (OLTPs), in part because they are far less common than osteochondral lesions of the talus.

Purpose: To evaluate the topographical characteristics of OLTPs and outcomes after surgical intervention, while analyzing the level of evidence (LOE) and quality of evidence (QOE) of the included studies.

Study Design: Systematic review; Level of evidence, 4.

Methods: A systematic review of the MEDLINE, EMBASE, and Cochrane Library databases was performed in accordance with PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Studies reporting clinical data for OLTPs were included. The LOE and QOE of the included studies were evaluated using a 5-level grading system and the modified Coleman Methodology Score, respectively.

Results: Included were 20 studies with 426 OLTPs; 4 studies were LOE 2 and 16 studies were LOE 4. Overall, 86.7% of OLTPs were associated with a traumatic history and/or previous ankle sprain. OLTPs were most commonly located in the centromedial region of the tibial plafond (30.4%), with the fewest number of OLTPs found in the anteromedial region of the tibial plafond (3.9%). In 17 of the studies, a total of 46.9% of OLTPs were associated with coexisting osteochondral lesions of the talus. The most frequently used surgical technique to treat OLTPs was microfracture, which resulted in good clinical outcomes at midterm follow-up.

Conclusion: The results of this systematic review indicated that OLTPs are frequently preceded by ankle trauma and are often associated with coexisting osteochondral lesions of the talus. Clinical outcomes after arthroscopic intervention appear to produce good results in the midterm, but the low LOE, poor QOE, marked heterogeneity, and underreporting of the data confound any recommendation based on this systematic review.

Keywords: osteochondral lesion; tibial plafond; ankle

Osteochondral lesions of the ankle represent a defect in the articular cartilage and the subchondral bone of the talus or tibia.14,39 These lesions are a common cause of chronic ankle pain and are often associated with a traumatic origin, including ankle fractures or ankle sprains.26,27,39 Osteochondral lesions of the talus (OLTs) account for most osteochondral lesions of the tibiotalar joint, and the literature reports ratios of 1 osteochondral lesion of the tibial plafond (OLTP) for every 14 to 20 OLTs.5,9,10 OLTs have been widely investigated, with several classification systems described, pathophysiological factors theorized, and treatment paradigms developed.23,25,32,34,41 Conversely, there is a paucity of data regarding OLTPs, in part because they are far less common than OLTs, with a frequently cited incidence of just 5% of all ankle osteochondral abnormalities.5,9,10,31
shape of the tibial plafond may account for the lower relative incidence of OLTPs.\textsuperscript{1,10,17} Despite the relatively lower incidence of OLTPs, they are a significant source of pain and disability, often requiring surgical intervention. Surgeons have used various arthroscopic interventions to treat OLTPs, including debridement, curettage, and microfracture, which have yielded good clinical outcomes at midterm follow-up.\textsuperscript{9,13,20,31} However, despite a recent increase in reporting of OLTPs in the literature, no consensus has been reached regarding the cause of OLTPs, their topographical distribution, or optimal treatments.

The purpose of this systematic review was to evaluate the topographical characteristics of OLTPs and outcomes after surgical intervention and to analyze the level of evidence (LOE) and quality of evidence (QOE) of the included studies.

\section*{METHODS}

\subsection*{Search Strategy}

During July 2019, a systematic review of the MEDLINE, EMBASE, and Cochrane Library databases was performed based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The following search terms were used: (osteochondral lesion OR OCL OR osteochondral defect OR OCD OR osteochondritis dissecans OR chondral OR cartilage) AND (tibia OR tibial OR ankle OR tibiotalar). The inclusion and exclusion criteria are shown in Table 1. After retrieval of the data, 2 independent reviewers screened the titles, abstracts, and full-text articles of all searched studies by applying the aforementioned criteria. A senior author (J.G.K.) was consulted to arbitrate any disagreements that arose.

\begin{table}[h]
\centering
\caption{Inclusion and Exclusion Criteria}
\begin{tabular}{|l|l|}
\hline
Inclusion Criteria & Exclusion Criteria \\
\hline
Clinical studies related to osteochondral lesions of the tibial plafond & Fewer than 10 patients \\
Published in a peer-reviewed journal & Case reports \\
Written in English & Cadaveric studies \\
& Animal studies \\
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\end{tabular}
\end{table}

\subsection*{Assessment of LOE and Methodological Quality}

The LOE was assessed using previously published criteria.\textsuperscript{40} The methodological QOE\textsuperscript{19} was assessed by 2 independent reviewers using the modified Coleman Methodology Score (MCMS).\textsuperscript{8} If any discrepancy existed, the senior author (J.G.K.) evaluated the available data and a consensus was reached. The QOE was considered excellent if the MCMS was between 85 and 100 (highest possible score), good if between 70 and 84, fair if between 55 and 69, and poor if <55.

\subsection*{Data Extraction and Evaluation}

Two independent reviewers (J.J.B., N.P.M.) independently extracted and assessed the data from each study. Data on patient and lesion characteristics, including lesion location, lesion size, and the presence of coexisting OLT, were extracted. To illustrate the location of OLTPs, the surface of the tibial plafond was divided into 9 zones using a 3 × 3 grid, as has been previously described.\textsuperscript{10} Data on the characteristics of the surgical procedure were also collected. Subjective outcomes, postoperative imaging, complications, failures, and reoperations were evaluated.

\subsection*{Statistical Analysis}

Statistical analyses were performed using SAS software Version 9.3 (SAS Institute). Descriptive statistics were calculated for all continuous and categorical variables. Continuous variables were reported as weighted mean and estimated standard deviation, whereas categorical variables were reported as frequencies with percentages. \( P < .05 \) was considered statistically significant.

\section*{RESULTS}

The initial search generated 29,561 studies. Of these, 20 met the inclusion and exclusion criteria (Figure 1).

\subsection*{Study Characteristics and Patient Data}

In the 20 studies, 426 patients were diagnosed with an OLTP. Data for patients with an OLTP were obtained from only 8 studies.\textsuperscript{\textsuperscript{5,5,9,10,13,16,20,31}} The weighted mean age was 38.8 ± 5.7 years (range, 24.0-44.1 years). From these 8 studies, 81 patients (48.2\%) were male. All but 5 of the 20 studies\textsuperscript{\textsuperscript{2,3,24,30,37}} recorded the cause of the lesion and concomitant injuries. Further, 86.7\% of patients had a history of trauma and/or associated ankle sprain.

A total of 4 studies\textsuperscript{\textsuperscript{10,17,30,37}} were LOE 2 and 16 studies\textsuperscript{\textsuperscript{1}} were LOE 4. The mean MCMS of all included studies was 44.1 ± 13.6. No studies were classified as having excellent quality per the MCMS. There were 2 studies\textsuperscript{\textsuperscript{6,9}} of good quality, 8 studies\textsuperscript{\textsuperscript{2,3,7,13,16,25,30,31}} of fair quality, and 10 studies\textsuperscript{\textsuperscript{8}} of poor quality. Study characteristics and patient data are listed in Table 2.

\subsection*{Lesion Characteristics}

In 17 studies (337 OLTPs), 179 (53.1\%) lesions were described as isolated tibial plafond lesions, and 158 (46.9\%) lesions entailed coexisting tibial plafond and talar osteochondral lesions.\textsuperscript{8} Of the patients who had coexisting osteochondral lesions, 27 (17.1\%) of the lesions were described as “kissing lesions.” Ross et al\textsuperscript{\textsuperscript{31}} and Irwin et al\textsuperscript{\textsuperscript{1}} both assessed patients from a similar database at

\textsuperscript{\textsuperscript{8}}References 2, 3, 6, 7, 9, 10, 13, 15, 16, 20, 24, 29, 30, 31, 36, 42.

\textsuperscript{\textsuperscript{9}}References 10, 14, 15, 17, 20, 24, 29, 36, 37, 42.

\textsuperscript{\textsuperscript{11}}References 2, 3, 6, 7, 9, 10, 13, 15, 16, 20, 24, 29-31, 36, 37, 42.
TABLE 2
Study Characteristics and Patient Data

| Lead Author (Year) | LOE | Patients With OLTP, n | Age, y | Sex, M/F, n | BMI | Follow-up, mo | MCMS |
|--------------------|-----|-----------------------|--------|-------------|-----|--------------|------|
| Aurich (2010)      | 4   | 3                     | 24.0   | —           | —   | 24.3         | 58   |
| Baldassari (2018)  | 4   | 27                    | 39.2   | 15/12       | —   | 72.0         | 58   |
| Chuckpaiwong (2008) | 4   | 19                    | —      | —           | —   | —            | 72   |
| Clanton (2014)     | 4   | 7                     | —      | —           | —   | —            | 58   |
| Cuttica (2012)     | 4   | 13                    | 32.9   | 9/4         | —   | 38.8         | 77   |
| Elias (2009)       | 2   | 38                    | 38.7   | 12/26       | —   | —            | 37   |
| Irwin (2018)       | 4   | 26                    | 43.5   | 16/10       | —   | —            | 58   |
| Kirschke (2016)    | 4   | 38                    | —      | —           | —   | —            | 31   |
| Körner (2018)      | 4   | 13                    | —      | —           | —   | —            | 54   |
| Lee (2019)         | 4   | 16                    | 42.1   | 5/11        | 34.2| 29.8         | 59   |
| Leontaritis (2009) | 2   | 5                     | —      | —           | —   | —            | 41   |
| Mologne (2007)     | 4   | 17                    | 38.0   | 9/8         | —   | 44.0         | 42   |
| Ogul (2019)        | 4   | 12                    | —      | —           | —   | —            | 35   |
| Okuda (2005)       | 4   | 15                    | —      | —           | —   | —            | 58   |
| Regier (2016)      | 4   | 27                    | —      | —           | —   | —            | 45   |
| Richter (2020)     | 2   | 37                    | —      | —           | —   | —            | 68   |
| Ross (2014)        | 4   | 31                    | 37.0   | 15/16       | —   | 44.0         | 58   |
| Sjibrandij (2000)  | 4   | 19                    | —      | —           | —   | —            | 32   |
| Takao (2005)       | 2   | 2                     | —      | —           | —   | —            | 39   |
| You (2016)         | 4   | 61                    | —      | —           | —   | —            | 32   |

*Dash indicates data not reported. BMI, body mass index; LOE, level of evidence; MCMS, modified Coleman Methodology Score; M/F, male/female; OLTP, osteochondral lesion of the tibial plafond.

*Grades the quality of evidence as excellent (85-100), good (70-84), fair (55-69), or poor (<55).
the same institution between the years of 2006-2014, thus due to potential overlap of patient cohorts, lesion characteristic data from the Ross et al study were excluded from the analysis. The lesion characteristics are shown in Table 3.

A total of 6 studies recorded the location of OLTPs using a 9-zone mapping system.3,9,10,13,16,41 Overall, 30.4% of OLTPs were found in zone 4 (centromedial). The region that contained the fewest OLTPs was zone 1 (anteromedial), with 3.9% of all OLTPs. The location of kissing lesions was reported in 2 studies.10,13 Kissing lesions occurred most frequently in zone 4 (30.8%). The location of the OLT was not significantly correlated with clinical outcomes in 2 studies.20,31 Figure 2 shows the distribution of the OLTPs.

Lesion size was reported in 6 studies.2,3,7,13,16,31 The weighted mean OLTP size was 103.2 ± 53.3 mm². Two studies recorded the depth of the osteochondral lesions.2,3 The weighted mean depth of OLTPs was 4.2 ± 1.1 mm. A total of 6 cystic lesions (1.5%) were recorded in 3 studies.3,9,20 One study demonstrated that increasing lesion size was significantly correlated with worse clinical outcomes.3

Surgical Characteristics

A total of 11 studies reported surgical techniques used to treat OLTPs.7 A variety of surgical techniques were used, the most common of which was bone marrow stimulation (BMS) in the form of microfracture (8 studies).6,7,9,13,15,16,20,31 A total of 6 studies reported concomitant surgical procedures, including lateral ankle ligament stabilization,9,16,31 microfracture for OLT,6,7,13,31 autologous osteochondral transplant (AOT) for OLT,13 peroneal tendon repair,16 peroneal retinaculum repair,16 distal tibial exostectomy,16 and Kidner procedure.16

**References 2, 3, 6, 7, 9, 13, 15, 16, 20, 30, 31.

### Table 3

| Lead Author (Year) | OLTPs, n | Isolated OLTPs, n | Coexisting OCLs, n | Kissing OCLs, n | Isolated OLTs, n | Size of OLTP, mm² | Depth of OLTP, mm | Cystic OLTPs, n |
|--------------------|----------|-------------------|--------------------|----------------|-----------------|-----------------|-----------------|-----------------|
| Aurich2 (2010)     | 3        | 3                 | 0                  | 0              | 15              | 15              | 127.0           | —               |
| Baldassari3 (2018) | 27       | 27                | 0                  | 0              | 0               | 0               | 180.0           | 4.4             |
| Chuckpaiwong6 (2008) | 19     | 0                 | 19                 | 0              | 105             | 86              | —               | —               |
| Clanton7 (2014)    | 7        | 3                 | 4                  | 0              | 0               | 0               | 37              | 33              | 31.0           | —              | —               |
| Cuttica9 (2012)    | 13       | 9                 | 4                  | 1              | 4               | 0               | —               | —               | 3              |
| Elias10 (2009)     | 38       | 32                | 6                  | 1              | 6               | 0               | —               | —               | —              |
| Irwin13 (2018)     | 26       | 0                 | 26                 | 9              | 83              | 57              | 63.6            | —               |
| Kirschke14 (2016)  | 38       | —                 | —                  | 51             | —               | —               | —               | —               |
| Körner15 (2018)    | 13       | 8                 | 5                  | 0              | 143             | 138             | —               | —               |
| Lee16 (2019)       | 16       | 12                | 4                  | 0              | 4               | 0               | 65.2            | —               |
| Leontaritis17 (2009)| 5       | —                 | —                  | 51             | —               | —               | —               | —               |
| Mologne20 (2007)   | 17       | 11                | 6                  | 0              | 6               | 0               | —               | —               | —              |
| Ogul24 (2019)      | 12       | 12                | 0                  | 0              | 54              | 0               | —               | —               |
| Okuda25 (2005)     | 19       | —                 | —                  | 12             | —               | —               | —               | —               |
| Regier29 (2016)    | 27       | 20                | 7                  | 0              | 20              | 13              | —               | —               |
| Richter30 (2020)   | 37       | 37                | 0                  | 0              | 221             | 221             | —               | —               |
| Ross31 (2018)      | 61       | 0                 | 61                 | 0              | 297             | 236             | —               | —               |

**Dashes indicate data not reported. OCL, osteochondral lesion; OLT, osteochondral lesion of the talus; OLTP, osteochondral lesion of the tibial plafond.**

**Figure 2.** Zone locations shown in a grid format superimposed onto the distal tibial plafond with corresponding heat maps demonstrating the distribution of all osteochondral lesions of the tibial plafond (n = 181 reported in 6 studies that recorded location of osteochondral lesions of the tibial plafond). Heat map shading corresponds to the percentage of lesions found in each zone, with darker coloration indicating higher percentages.

**References 2, 3, 6, 7, 9, 13, 15, 16, 20, 30, 31.**
Clinical Outcomes

A total of 11 studies examined clinical outcomes after the treatment of OLTPs. The weighted mean time from onset of injury to surgical intervention was 17.8 ± 12.3 months (range, 2.7-40.0 months). Only 6 of these studies reported adequate data from which outcomes after treatment of OLTPs could be extracted. The weighted mean postoperative follow-up time was 42.6 ± 15.2 months (range, 38.8-72.0 months). Two studies used the American Orthopaedic Foot and Ankle Society (AOFAS) score. The weighted mean preoperative AOFAS score was 52.6 ± 0.5 (range, 52.0-53.0) and the postoperative score was 84.0 ± 3.0 (range, 81.0-87.0). One study found no significant correlations between body mass index and clinical outcomes, sex and clinical outcomes, and age and clinical outcomes. A total of 3 studies reported return to sporting activities. Lee et al demonstrated that 16 patients (100%) returned to their sporting activities after synovectomy, curettage, and microfracture of the OLTP. Cuttica et al reported that 9 patients (69.2%) returned to their sporting activities after synovectomy, curettage, and microfracture of the OLTP. Aurich et al reported that 2 patients (66.7%) returned to their previous sporting activity after matrix-associated chondrocyte implantation.

In 4 studies, postoperative magnetic resonance imaging (MRI) was conducted at final follow-up. A total of 3 studies used the MOCART (magnetic resonance observation of cartilage repair tissue) scoring system, according to which 30 patients (56.6%) displayed complete filling of the defect, 15 patients (28.3%) had incomplete filling of the defect, 5 patients (9.4%) had subchondral bone exposure, and 3 patients (5.7%) had hypertrophic infill of the defect. MOCART scores were negatively correlated with increasing age and lesion area in 2 studies. In 1 study, reactive bone marrow edema was found in 4 patients who had poor outcomes after surgical intervention of the OLTP.

In total, 6 complications were observed in 209 patients (2.9%). Complications included chronic ankle pain, subchondral cyst formation, superficial peroneal nerve dysesthesis, deep vein thrombosis, and sciatic and saphenous nerve neurapraxia. Further surgical intervention was recorded in 3 studies. Cuttica et al reported that 3 patients (23.0%) required further surgical intervention after microfracture, including 1 repeated microfracture, 1 removal of an osteochondral plug with a repeated microfracture, and 1 AOT procedure. Mologne and Ferkel reported that 1 patient (5.9%) required iliac crest bone grafting after arthroscopic excision of a cystic lesion and transmalleolar drilling. Ross et al reported that 1 patient underwent AOT for an OLTP. The clinical outcomes and complications are listed in Table 4.

DISCUSSION

The most important finding of this systematic review was that OLTPs are frequently preceded by ankle trauma and are often associated with coexisting osteochondral lesions of the talus. The cause of OLTPs may be considered in light of external and internal factors. The external factors implicated in OLTP development may be related to the mechanism of injury producing the OLTP. In an ankle inversion injury, the medial back shoulder of the talus may come into contact with the medial aspect of the tibial plafond. Over time, recurrent ankle sprains may lead to degradation of the cartilage that lines the medial articular surface of the distal tibia. The current review found that almost half of all OLTPs were located in the medial region of the tibial plafond and were strongly associated with a history of ankle sprains, suggesting that OLTPs may be associated with a chronic cause. The low rate of kissing lesions (17.1%) further suggests that repetitive trauma from recurrent ankle sprains may play a more significant role in the development of osteochondral lesions of the tibiotalar joint, rather than high-energy impact injuries, which would lead to direct impaction of the tibia and the talus and subsequent juxtaposed or kissing lesions.

Internal factors influencing the cause of OLTPs include variations in cartilage morphology lining the tibial plafond. The cartilage at the centromedial region is considered to be the least rigid and least stiff compared with cartilage at other regions of the tibial plafond. This was the most common site of OLTPs, and this mechanical property of regional cartilage variation may predispose it to greater risk of injury and subsequent development of OLTP. In contrast, the most rigid region of the cartilage at the surface of the distal tibia is the anteromedial region, where the lowest number of OLTPs occurred, possibly reflecting its ability to resist cartilage damage. Other local topographical factors have been described to explain why OLTPs appear to be less frequent than OLTs, despite both having a traumatic origin. The talus is a convex shape in comparison with the concave shape of the tibial plafond. The axial forces acting on the convex talus exert compressive shear forces on the articular surface, placing the articular cartilage and the subchondral surface at high risk of injury. Conversely, the axial forces acting on the concave tibial plafond create tensile shear forces. This allows for more efficient force distribution across the articular surface, thus reducing the likelihood of disruption of the articular cartilage and subchondral surface. Furthermore, the cartilage that lines the surface of the tibial plafond is stiffer than the cartilage lining the talus. Therefore, both the morphological and biomechanical differences between the tibia and talus may contribute to the lower incidence of OLTPs.

BMS in the form of microfracture was the most commonly used surgical procedure to treat OLTP, with improvement in clinical scores reported in all studies at final follow-up. Follow-up was typically <4 years, and these data should be interpreted in light of the relatively

References 2, 3, 6, 7, 9, 13, 15, 16, 20, 30, 31.
| Lead Author (Year) | No. of OLTPs | OLTP Score, Preoperative/Postoperative | Surgery Performed | Follow-up for OLTP, mo | Complications After OLTP | Reoperations After OLTP | Concomitant Operations |
|-------------------|--------------|----------------------------------------|-------------------|------------------------|--------------------------|-------------------------|------------------------|
| Aurich\(^2\) (2010) | 3            | 24.3 | Matrix-associated chondrocyte implantation | 3 | 3 incomplete filling on MRI (MOCART) | | |
| Baldassari\(^3\) (2018) | 27          | 72.0 | Bone marrow–derived cell transplant | 18 | 18 complete filling, 6 incomplete filling on MRI (MOCART) | | |
| Chuckpaiwong\(^6\) (2008) | 19          | Microfracture | 19 microfracture for OLT | | 19 microfracture | | |
| Clanton\(^7\) (2014) | 7           | Microfracture | 7 microfracture for OLT | | Modified AOFAS: 40.2/50.4 | 4 bone marrow edema on MRI | 4 microfracture for OLT |
| Cuttica\(^9\) (2012) | 13          | 38.8 | 9 microfracture, 2 drilling with back fill, 1 osteochondral plug | 13 | 1 chronic ankle pain | | 3 lateral ankle ligament stabilization |
| Irwin\(^13\) (2018) | 26          | Microfracture and concentrated bone marrow aspirate | 26 microfracture or AOT for OLT | | FAOS: 49.4/83.8 | | |
| Körner\(^15\) (2018) | 13          | Microfracture | 13 bone marrow stimulation | | Modified AOFAS: 35.2/50.4 | 1 chronic ankle pain | |
| Lee\(^16\) (2019) | 16          | 29.8 | Microfracture | 16 | 9 Broström-Gould, 3 peroneal tendon repair, 4 peroneal retinaculum repair, 4 distal tibial exostectomy, 1 Kidner procedure | | |
| Mologne\(^20\) (2007) | 17          | 44.0 | 17 arthroscopic debridement and excision, 5 transmalleolar drilling, 2 microfracture, 2 iliac bone grafting | 17 | 1 sciatic nerve neurapraxia, 1 saphenous nerve neurapraxia | 1 iliace crest bone grafting | |
| Richter\(^30\) (2020) | 37         | 19 matrix-associated stem cell transplant, 18 autologous matrix-induced chondrogenesis and peripheral blood concentrate | | | | | |
| Ross\(^31\) (2014) | 31          | 44.0 | Microfracture | | FAOS: 50.5/74.3 | 12 complete filling, 7 incomplete filling on MRI (MOCART) | 4 lateral ligament repair, 12 microfracture for OLT |

\(^a\)AOFAS, American Orthopaedic Foot and Ankle Society; AOT, autologous osteochondral transplant; FAAM, Foot and Ankle Ability Measure; FAOS, Foot and Ankle Outcome Score; MCS, Mental Component Score; MOCART, magnetic resonance observation of cartilage repair tissue; MRI, magnetic resonance imaging; OLT, osteochondral lesion of the talus; OLTP, osteochondral lesion of the tibial plafond; PCS, Physical Component Score; SF-12, 12-Item Short Form Health Survey; VAS, visual analog scale.
short follow-up. It is known that BMS produces a physiological grout that can fill the defect with type 2 collagen early in the reparative process. Over time, owing to mechanical and biological factors, this dedifferentiates to type 1 collagen with a reduction in proteoglycans and diminution of mechanical characteristics. The fibrocartilage infill produced by microfracture in patients with OLTs struggles to withstand the high pressures in the tibiotalar joint over time, leading to degradation and long-term failure. It is unknown whether the repair cartilage at the tibial plafond can maintain long-term integrity; thus, further studies with longer follow-up should be conducted.

Various biological adjuvants were used by surgeons in the included studies. Baldassari et al. used bone marrow–derived cell transplant (BMDCT) to treat OLTPs and reported improvement in AOFAS scores at final follow-up. BMDCT is a scaffold-based biological reconstructive technique that has shown promising results in patients with OLTs. Follow-up MRI scans demonstrated a lower incidence of subchondral edema in this patient cohort compared with other groups of patients treated with microfracture, suggesting that BMDCT may be less traumatic to the subchondral bone. The use of concentrated bone marrow aspirate (CBMA) as a biological adjunct to BMS for OLTP was observed in 1 study. CBMA contains a rich source of mesenchymal stem cells and growth factors and has been shown to promote the development of cartilage repair tissue containing primarily type 2 collagen, reflecting “hyaline-like” repair tissue formation. CBMA has been demonstrated to improve border repair tissue integration after BMS for OLT and could possibly enhance the longevity of the repair tissue in OLTPs. Irwin et al. reported improved functional outcomes in their patient cohort at final follow-up; however, follow-up MOCART scores were not reported. Both Baldassari et al. and Irwin et al. reported no complications or reoperations in their patient cohorts, unlike other groups of patients who were not treated with any biological adjuvants. The current study did not have the power required to establish that these biological adjuncts should be considered over BMS alone, and further long-term studies will be required to find the optimal treatment.

Lesion size of OLTs has been used to predict clinical outcomes and is often used to guide further management. The current review has demonstrated that lesion size may be an important prognostic factor after surgical intervention for OLTPs. Increasing lesion size was negatively correlated with clinical outcome scores and MOCART scores at final follow-up. Notably, MRI scans at mid-term follow-up showed that subchondral bone marrow edema was more prevalent in larger tibial lesions compared with smaller tibial lesions. The subchondral bone plays a mechanically protective role and is involved in maintaining the integrity of the cartilage that lines its surface via the regulation of signaling pathways by intercellular cross-talk. Although transient reactive subchondral edema may be a normal physiological process after surgical intervention for OLTs, the presence of subchondral edema at mid-term follow-up has been shown to be a harbinger of poor clinical outcomes after BMS for OLTPs. The damage to the subchondral bone observed postoperatively in larger tibial lesions at mid-term follow-up suggests that larger OLTPs may have impaired regenerative capacity and thus may have poor long-term cartilage survival. Further studies must be carried out to develop prognostic size guidelines so as to achieve optimal outcomes after intervention for OLTPs.

Limitations

This systematic review has several inherent limitations and/or potential biases. The search was limited to MEDLINE, EMBASE, and Cochrane Library Database articles published exclusively in English. There was inconsistency in the reporting of data between studies, limiting any meaningful cross-sectional analysis. The LOE of the included studies was graded as low with poor methodological quality. Finally, the data extraction was not performed blindly but was carried out by 2 independent reviewers and later confirmed by the lead author.

CONCLUSION

This systematic review has found that OLTPs are frequently preceded by ankle trauma and are often associated with coexisting OLTs. Clinical outcomes after arthroscopic intervention appear to produce good results in the midterm, but the low LOE, poor QOE, marked heterogeneity, and underreporting of the data confound any recommendation based on this systematic review.

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