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Predictors of Donor Site Morbidity Following Osteochondral Graft Harvesting from the Healthy Knee using Lysholm Knee Score

Albert Çakar[1], Mehmet Akif Aktaş[2], Ayşegül Atıcı[3]

[1]University of Health Sciences Türkiye, İstanbul Training and Research Hospital, Clinic of Orthopedics and Traumatology, İstanbul, Türkiye
[2]Hakkari Yüksekova State Hospital, Clinic of Orthopedics and Traumatology, Hakkari, Türkiye
[3]University of Health Sciences Türkiye, Kartal Dr. Lütfi Kırdar City Hospital, Clinic of Physical Therapy Rehabilitation, İstanbul, Türkiye

ABSTRACT

Introduction: Donor site morbidity (DSM) is a notable complication following osteochondral graft harvesting for mosaicplasty, impacting patient outcomes despite the procedure's efficacy in treating cartilage defects. Identifying predictors of DSM is essential for optimizing patient selection and surgical techniques. To determine the incidence and predictors of DSM in patients undergoing osteochondral graft harvesting from the knee, focusing on factors such as age, gender, body mass index (BMI), donor site location, graft size, and number of grafts.

Methods: A retrospective review was conducted on 52 patients (57 knees) who underwent osteochondral graft harvesting for talus osteochondral lesions between 2015 and 2024. The Lysholm knee score (LKS) was used to evaluate DSM, with scores categorized as excellent (>90), good (84-90), fair (65-83), or poor (<65). Clinical and demographic data were analyzed to identify predictors of DSM.

Results: The mean follow-up was 36.2±26.6 months. The mean LKS improved significantly over time, reaching 97.1±4.1 after 12 months. DSM, defined as an LKS below "excellent," was observed in 9.8% of knees. No significant associations were found between DSM and predictors such as age, gender, BMI, donor site location, or the number and size of grafts harvested. Complications were minimal, with only one postoperative hemarthrosis and two cases of anterior knee pain with deep knee flexion.

Conclusion: DSM following osteochondral graft harvesting is relatively low, with most patients achieving excellent outcomes. No clinical or demographic predictors were significantly associated with DSM, suggesting that careful surgical technique may mitigate potential morbidity.

Keywords: Osteochondral graft harvesting, donor site morbidity, mosaicplasty, knee pain, osteoarthritis, predictors

Introduction

Autologous osteochondral grafting, also called mosaicplasty, is a common treatment for large and deep cartilage lesions in load-bearing joints, such as the knee and ankle. Initially described by Hangody et al. (1), this technique has become widely accepted for treating focal full-thickness chondral lesions of the knee. It involves harvesting one or more cylindrical autologous osteochondral plugs from the non-weight-bearing areas of the femoral condyle and transplanting them into matching sockets at the defect site (1). This method offers significant advantages, including delivering native cartilage and addressing subchondral defects in a single procedure. Additionally, it is cost-effective and allows for a shorter rehabilitation period (2). While it has demonstrated favorable outcomes in restoring joint function and reducing pain at the site of the lesion, concerns about donor site morbidity (DSM) persist. DSM refers to the complications that arise at the site where the graft is harvested, including pain, functional impairment, and the development of osteoarthritis. The incidence of DSM varies widely across studies from 6% to 20%, with reports ranging from negligible to significant morbidity rates (3-5). This variability underscores the need for a more nuanced understanding of the factors contributing to DSM.

Despite the widespread use of osteochondral grafting, there remains a lack of consensus on the predictors of DSM. Existing literature has provided conflicting results regarding the impact of factors such as patient age, body mass index (BMI), gender, the number of grafts harvested, and the size of the grafts, on the likelihood and severity of DSM (3-8). Moreover, while some studies have suggested that increased age and higher BMI are associated with poorer outcomes, others have found no significant correlation (9). Additionally, the influence of gender on DSM is not well understood, with some evidence indicating potential differences in outcomes between male and female patients (4,5,10).

Address for Correspondence: Albert Çakar MD, University of Health Sciences Türkiye, İstanbul Training and Research Hospital, Clinic of Orthopedics and Traumatology, İstanbul, Türkiye
E-mail: dralbertcakar@gmail.com **ORCID ID:** orcid.org/0000-0002-1422-2208

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These inconsistencies highlight a critical gap in the research that needs to be addressed to optimize patient selection and surgical techniques, thereby minimizing the risk of DSM.

This study hypothesizes that the incidence of DSM following osteochondral graft harvesting is significantly influenced by patient-specific factors such as age, BMI, and sex, as well as procedural factors, including the number and size of the grafts harvested. Specifically, it is hypothesized that older age, higher BMI, and harvesting multiple or larger grafts are associated with increased DSM. The study also posits that gender may play a role in the incidence and severity of DSM, with potential differences in outcomes between male and female patients. By identifying these predictors, the study aims to contribute to a more individualized approach to osteochondral grafting, ultimately improving patient outcomes.

Methods

Patients and Study Design

This retrospective study was conducted on a cohort of patients who underwent osteochondral graft harvesting as part of surgical treatment for talus osteochondral lesions between 2015 and 2024 at the authors' institution. The inclusion criteria were: 1) Patients who had undergone osteochondral graft harvesting from the knee using the mosaicplasty technique, 2) patients with complete clinical and radiological data available for analysis. Patients with prior knee surgeries, pre-existing knee conditions, or incomplete follow-up data were excluded from the study. During the study period, 76 patients were treated for talus osteochondral lesions. Of these, 21 patients were excluded because they received acellular cartilage scaffolds rather than osteochondral grafts from the knee. From the remaining 55 patients, one patient was excluded because of death, and two patients were lost to follow-up. Consequently, 52 patients were included in the study. Since five patients underwent bilateral ankle procedures, a total of 57 knees were analyzed for comparison. The University of Health Sciences Türkiye, İstanbul Training and Research Hospital Institutional Review Board approved the study (approval number: 105, date: 08.11.2024), and informed consent was obtained from all participants. All study procedures were conducted following the ethical guidelines outlined in the Declaration of Helsinki and its subsequent amendments.

Surgical Technique and Postoperative Rehabilitation

All patients underwent osteochondral graft harvesting utilizing the Mosaicplasty technique. The procedure was conducted with the patient in a supine position under spinal anesthesia. A lateral parapatellar arthrotomy was performed to gain access to the femoral condyle. Cylindrical osteochondral grafts were harvested from the non-weight-bearing regions of the lateral femoral condyle using a dedicated harvesting instrument. The diameter of the grafts ranged from 6 mm to 10 mm, depending on the dimensions of the defect being treated (Figure 1). When multiple grafts were required, meticulous care was taken to minimize the cumulative donor site defect size. Following the harvesting procedure, the donor site defects were either allowed to heal by secondary intention or filled with a synthetic collagen membrane.

A below-knee splint was applied postoperatively due to the medial malleolar osteotomy performed in all patients. Patients were instructed to limit weight-bearing on the operated leg for four weeks and to follow a structured rehabilitation program. Cryotherapy was applied around the knee, and an elastic bandage was used for compression. Full-range active knee range-of-motion (ROM) exercises were initiated on the first postoperative day.

Outcome Measurements

In this study, the primary outcome measure was the Lysholm knee score (LKS) (11). LKS is a patient-reported score from 0 to 100, which evaluates limping, using crutches or canes, locking sensation and instability of the knee, pain, swelling, stair climbing, and squatting. The scores were classified as excellent (>90), good (84-90), fair (65-83), and poor (<65) (12). DSM was defined as an LKS not categorized as "excellent". The patient's knee ROM, patellar grind test results, and functional movements were evaluated at the final follow-up. All complications observed during the follow-up period were recorded, including early postoperative hemarthrosis, superficial or deep infections at the donor site, and any secondary procedures. Radiological assessments were conducted using standard anteroposterior and lateral radiographs to detect osteoarthritic changes at the donor site. The Kellgren-Lawrence grading system was employed for the classification of the severity of these changes. In addition, imaging evaluations, such as magnetic resonance imaging (MRI), were reviewed when applicable.

Statistical Analysis

All statistical analyses were performed using SPSS Statistics Base v23 (IBM Corp., Armonk, NY). Descriptive statistics were presented as mean

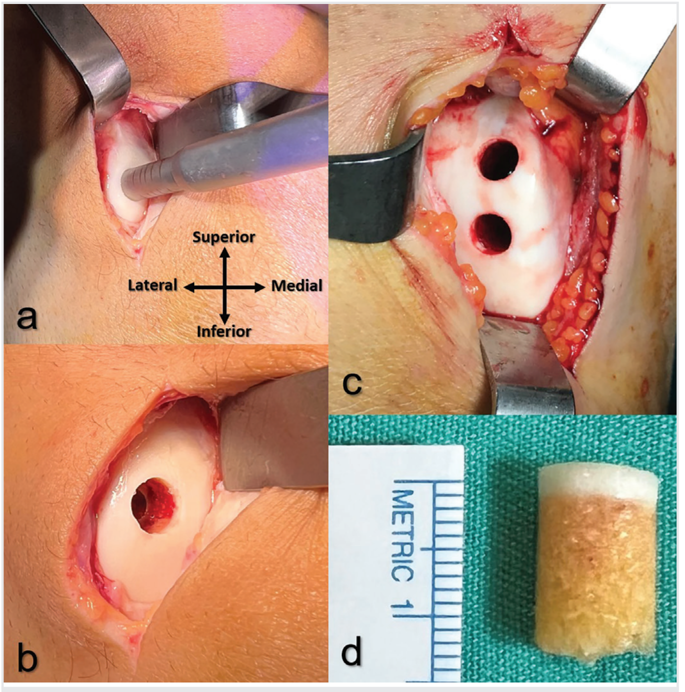

Figure 1. Osteochondral graft harvesting using the mosaicplasty technique. (a) Exposure of the femoral condyle through lateral parapatellar arthrotomy. (b) Single cylindrical graft harvest site. (c) Two cylindrical graft harvest sites. (d) An 8 mm cylindrical osteochondral graft specimen. Informed consent was obtained from the patient to use the images for scientific purposes

± standard deviation for continuous variables and as frequencies and percentages for categorical data. The normality of continuous variables, including LKS, was assessed using the Shapiro-Wilk test, Kolmogorov-Smirnov test, and visual inspection. Differences in LKS scores between groups (e.g., gender and defect filling) were evaluated using the independent samples t-test for normally distributed data and the Mann-Whitney U test for non-normally distributed data. For patients with multiple LKS measurements, the Wilcoxon signed-rank test analyzed changes between the first and second assessments. The relationship between the LKS and clinical and demographic variables was evaluated using Pearson's correlation test. A linear regression analysis was performed to identify predictors of the final LKS. Variance Inflation Factor (VIF) was used to check for multicollinearity, and predictors with VIF >10 were excluded. Results were considered statistically significant at $p<0.05$.

Results

The study included 52 patients (57 knees), with a mean age of 42.8±12.7 years (range: 17-68). The cohort consisted of 23 males and 29 females. The mean follow-up period was 36.2±26.6 months (range: 1-108). Demographic and clinical characteristics of the study population are presented in Table 1.

Lysholm Knee Score Over Time

Seventy assessment points were analyzed, including repeated LKS measurements from 13 patients. A significant positive correlation was found between the LKS and time, indicating an improvement in scores over time ($r=0.398$, $p=0.001$). In the first three months, the mean LKS was 74.6 (range: 38-95). In the second quarter, the mean LKS increased to 81.1 (range: 54-94). Between 6 and 12 months, the mean LKS further improved to 87.8 (scores: 71-100). After 12 months, the mean LKS reached 97.1 (range: 80-100) (Figure 2). In the 13 patients with repeated measurements, there was an interval of 10 months between the first and second assessments. The mean LKS significantly increased from 79.9 to 94.2 (Table 2).

Predictors of Donor Site Morbidity following Osteochondral Harvesting

In this analysis, patients with a follow-up period of less than 12 months were excluded due to significant improvements observed in patients followed for more than 12 months. For the 51 knees with a follow-up exceeding 12 months, the mean LKS was 97.0±4.1 (range: 80-100). Of these, 5 knees (9.8%) had LKS categorized as good, while 46 (90.2%) were classified as excellent. No significant correlation was found between

Table 1. Demographic and clinical characteristics of patients

Variables	Data
Number of patients	52
Number of knees	57
Age at the time of operation (years ± SD, range)	42.8±12.7 (17-68)
Gender (M/F)	23/29
Side (R/L)	22/35
Height (cm ± SD, range)	165.4±8.2 (146-184)
Weight (kg ± SD, range)	77.3±11.5 (52-105)
BMI (kg/m^2 ± SD, range)	28.3±4.3 (19-39)
Number of osteochondral grafts (mean ± SD, range)	1.7±0.6 (1-3)
Graft area (mm^2 ± SD, range)	70.5±27.6 (28-150)
Follow-up (months ± SD, range)	36.2±26.6 (1-108)

SD: Standard deviation, M: Male, F: Female, R: Right, L: Left, BMI: Body mass index

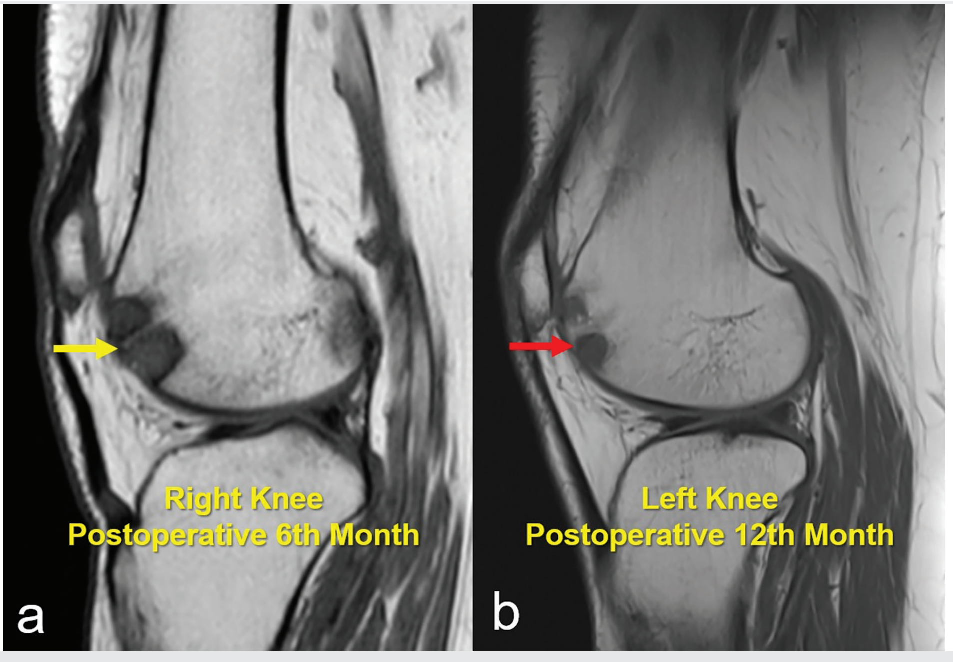

Figure 2. LKS over time. (a) Scatter plot showing LKS by follow-up period (months), with a trend line indicating a positive correlation over time ($r=0.398$, $p=0.001$). (b) Box plot displaying LKS grouped by follow-up periods: 0-3 months (mean: 74.6), 3-6 months (mean: 81.1), 6-12 months (mean: 87.8), and 12+ months (mean: 97.1). The scores improve progressively with longer follow-up periods

LKS: Lysholm knee score

final LKS values and clinical or demographic characteristics (Table 3). At the final follow-up, LKS scores were similar between males and females (97.4±4.7 vs. 96.7±3.7, p=0.562). Additionally, there was no significant difference in LKS scores between patients who received a collagen matrix at the donor site (n=10, 96.4±3.4) and those who did not (n=41, 97.1±4.3, p=0.568).

A linear regression analysis was conducted to explore the relationship between LKS and demographic and clinical variables. Due to a high correlation between height, weight, and BMI, there was significant multicollinearity (VIF >10), height and weight were excluded, and only BMI was included in the analysis. The model included the following predictors: age, gender, BMI, follow-up duration, donor area, number of grafts, and defect filling. None of these predictors demonstrated a statistically significant association with the final LKS (Table 4). The overall model had low explanatory power (R^2=0.103, adjusted R^2=-0.043).

Imaging Findings

No evidence of osteoarthritic changes was identified in any of the patients through radiographic examination of the knee. In a patient who received grafts from both knees six months apart, an MRI was performed one year after the initial operation, due to a catching sensation in the knee. The MRI results demonstrated that the donor area exhibited a significantly greater degree of filling in the knee at the one-year follow-up compared to the knee at the six-month follow-up (Figure 3).

Complications

One patient developed postoperative hemarthrosis, which required hematoma aspiration on the first postoperative day. The patient's symptoms resolved after applying cryotherapy and a compression bandage, and no recurrence occurred. No deep or superficial infections were observed in any patient. Two patients reported anterior knee pain at the end range of deep flexion. Additionally, two patients experienced occasional knee catching; however, their patellar mobility was normal on examination, and grind tests were negative. Apart from these issues, no other complications were observed in this series.

Table 2. Change in the consecutive assessment of LKS in 13 patients with multiple assessments

Variables	First time	Second time	p
Follow-up time	5.2 (1-11)	15.2 (11-21)	
LKS	79.9±17.3	94.2±1.5	**0.005***

*The Wilcoxon signed-rank test, LKS: Lysholm knee score

Discussion

The results of this study indicate that DSM following osteochondral graft harvesting from the knee is relatively low, with only 9.8% of knees exhibiting LKS below the "excellent" category after one year. Most of the patients demonstrated significant improvements in LKS over time, ultimately achieving optimal knee function with minimal complications. Patients can be reassured that donor site symptoms typically diminish and resolve completely by the end of the first year. We hypothesized that DSM might be associated with factors such as age, gender, BMI, graft area, number of grafts harvested, and the use of collagen matrix to fill the donor site. However, our findings did not support these hypotheses. No significant differences in knee function were observed between male and female patients. Similarly, although we anticipated that harvesting a larger number of grafts or larger graft size might lead to poorer outcomes, no correlation was found between LKS and either graft area or the number of grafts harvested. In our study, 91.2% of cases involved harvesting only one or two grafts, representing a relatively small donor site area that did not significantly impact knee function. We also speculated that older age might delay donor site healing, potentially resulting in functional impairment or osteoarthritic changes. Nevertheless, no relationship was found between age and knee function outcomes. Notably, our study encompassed a wide age range, from 17 to 68 years. Finally, while filling the donor site with a collagen membrane was hypothesized to accelerate healing and improve cartilage quality, this intervention did not show a measurable effect on functional outcomes. Overall, the low morbidity rate and minimal impact on knee function suggest that autologous osteochondral graft harvesting is a safe procedure. The results appear to be unaffected by demographic

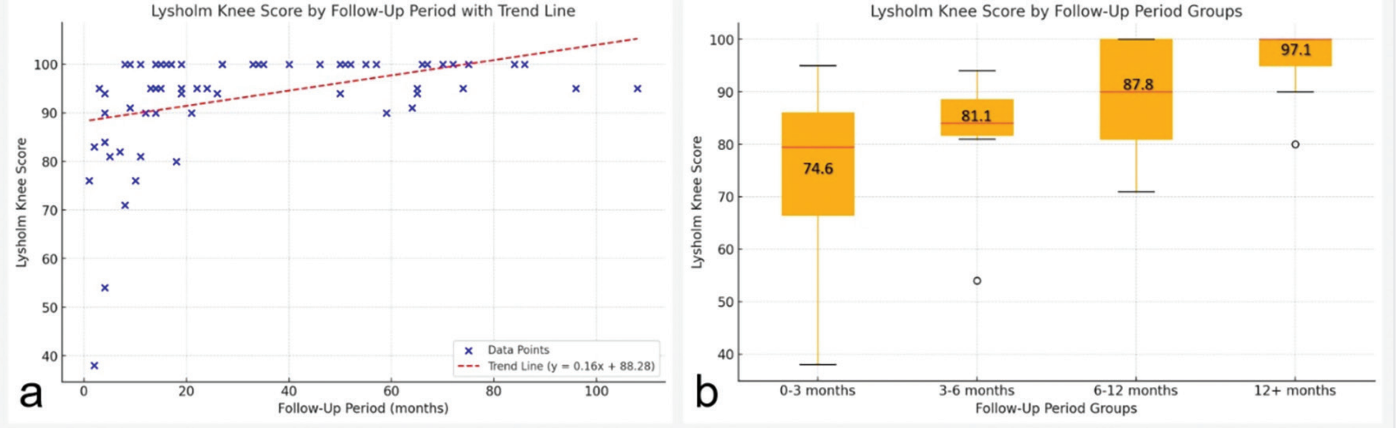

Figure 3. MRI Comparison of donor site healing in bilateral knees (a) Right knee at the 6-month postoperative follow-up (yellow arrow) showing incomplete donor site filling. (b) The left knee at the 12-month postoperative follow-up (red arrow) demonstrated significantly greater donor site filling. The MRI highlights improved donor site healing with a longer follow-up duration

MRI: Magnetic resonance imaging

or clinical characteristics, reinforcing the reliability and efficacy of this technique.

In the literature, limited studies specifically focus on DSM following osteochondral graft harvesting from a healthy knee (Table 5) (7,9,10,13-19). These studies use various parameters to assess knee function and outcome measurements, leading to conflicting and inconsistent results. We believe that the differences in the definition of DSM, the follow-up duration, and the relatively small sample sizes in some studies may account for these discrepancies in outcomes.

The length of follow-up has a significant impact on the reported outcomes of DSM. In our study, DSM symptoms typically resolved within the first year, with most patients achieving excellent LKS. This is consistent with Iwasaki et al. (13), who reported complete resolution of donor site symptoms by 26 months postoperatively. In contrast, Reddy et al. (14) observed persistent knee instability in some patients at a mean follow-up of 47 months. Andrade et al. (4) highlighted that DSM rates varied according to the length of follow-up, with knee-to-knee mosaicplasty procedures reporting morbidity rates ranging from 5.9% to 22%. Our results suggest that shorter follow-ups may underestimate DSM, while longer follow-ups, such as those reported by Paul et al. (10), highlight gradual improvement over time.

Table 3. Correlation between the LKS at the follow-up and the clinical characteristics

Variables		LKS at the final follow-up
Age (years)	rho	0.028
	p-value	0.847
Weight (kg)	rho	-0.117
	p-value	0.415
Height (cm)	rho	0.074
	p-value	0.608
BMI (kg/m^2)	rho	-0.138
	p-value	0.332
Number of grafts (n)	rho	0.015
	p-value	0.915
Donor area (mm^2)	rho	-0.068
	p-value	0.634
Follow-up duration (months)	rho	0.138
	p-value	0.336

LKS: Lysholm knee score, BMI: Body mass index, rho: Pearson correlation coefficient

In the current study, no significant relationship was found between age and knee function outcomes. This is consistent with the findings of Paul et al. (10) and Nakagawa et al. (9), who reported no significant effect of age on DSM. However, Kurtuluş et al. (19) found that older patients had lower LKS and more degenerative changes. Similarly, Matricali et al. (3) suggested that age may influence the healing potential of donor sites, with older patients at higher risk of osteoarthritic changes. The wide age range of our study (17 to 68 years) supports the conclusion that DSM is generally low regardless of age, although older patients may require closer follow-up for degenerative changes.

The results of our study demonstrated no statistically significant differences in knee function outcomes between male and female patients. Both groups exhibited comparable LKS and overall recovery profiles. This finding is consistent with Guo et al. (18), who reported no correlation between gender and functional outcomes, including LKS and MRI findings, after osteochondral graft harvesting. Similarly, Andrade et al. (4) concluded that gender did not significantly influence DSM following mosaicplasty, emphasizing that other factors, such as graft size and location, were more influential. In contrast, Kurtuluş et al. (19) observed lower visual analog scale pain scores in female patients, which suggests the potential for differences in pain perception or reporting between genders. Moreover, Bexkens et al. (5) documented a DSM rate of 7.8% in a cohort where grafts were harvested from the femoral condyle. However, the study did not identify any significant gender-based differences. These discrepancies in findings may be attributed to variations in physical activity levels, pain thresholds, or psychological factors that influence postoperative recovery and symptom reporting. Considering these findings, our results lend support to the conclusion that gender is not a primary determinant of DSM or knee function outcomes. While some studies have suggested the presence of subtle differences in pain perception or subjective reporting, these factors do not appear to translate into significant functional disparities between male and female patients. This reinforces the overall reliability and safety of autologous osteochondral graft harvesting, regardless of gender.

Table 4. Linear regression analysis predicting LKS at the final follow-up

Variables	B	S.E.	Beta	t	p
Constant	102,538	5,340		19,201	0.001
Age	0.082	0.060	0.254	1,365	0.179
Gender	-1.776	1,434	-0.210	-1.239	0.222
BMI	-0.192	0.151	-0.199	-1.277	0.208
Follow-up duration	0.028	0.028	0.173	0.997	0.324
Donor area	-0.035	0.035	-0.235	-1.003	0.321
Number of grafts	0.466	1,616	0.070	0.288	0.775
Defect filling	-1.280	1,731	-0.123	-0.740	0.464
R^2			0.103		
Adjusted R^2			-0.043		

LKS: Lysholm knee score, BMI: Body mass index, S.E.: Standard error, B: The column represents the unstandardized coefficient. Beta: The column represents the standardized coefficient

Higher BMI was not associated with poorer outcomes in our study, as both high and low BMI groups demonstrated similar LKS and functional recovery following osteochondral graft harvesting. This finding agrees with Andrade et al. (4), who conducted a systematic review and found no significant correlation between BMI and DSM in mosaicplasty procedures. Similarly, Guo et al. (18) reported that BMI did not significantly influence MRI-based cartilage quality or functional outcomes following graft harvesting. In contrast, other studies have suggested that elevated BMI may negatively impact DSM outcomes. Paul et al. (10) and Reddy et al. (14) observed poorer LKS and WOMAC scores in patients with higher BMI, attributing these outcomes to increased mechanical stress on the donor site during weight-bearing activities. The additional load on the knee joint in individuals with higher BMI may delay healing, increase inflammation, or accelerate degenerative changes at the donor site. Shimozono et al. (8) also noted a higher prevalence of DSM in patients with elevated BMI in their meta-analysis, suggesting that mechanical overload might contribute to donor site pain and functional limitations. Biomechanical studies support these findings by demonstrating increased contact pressures on the patellofemoral joint in individuals with higher BMI. Garretson et al. (20) reported that osteochondral defects in weight-bearing areas experience higher rim stress concentrations, which could lead to degenerative changes over time. This suggests that higher BMI might exacerbate stress-related degeneration at the donor site, particularly when larger grafts are harvested from high-load areas. The discrepancies in these results may be attributed to differences in study design, follow-up duration, and sample size. For instance, Matricali et al. (3) highlighted that smaller sample sizes and shorter follow-ups might fail to capture the long-term impact of BMI on DSM. Additionally, the location of graft harvesting might play a role, harvesting from areas with lower contact pressures, as suggested by Garretson et al. (20), may mitigate the negative effects of higher BMI. Our findings indicate that BMI may not universally affect DSM outcomes, particularly when graft harvesting is limited to small donor site areas and careful surgical techniques are employed. However, it remains essential to consider BMI as a potential factor during preoperative planning, especially for patients with elevated BMI who may require additional postoperative monitoring and weight management strategies to optimize recovery.

In our study, 91.2% of patients had one or two osteochondral grafts harvested, resulting in minimal DSM. This finding is consistent with Fraser et al. (16) and Nakagawa et al. (9), who reported no significant differences in knee function outcomes between single and double graft harvests. Similarly, Shimozono et al. (8) conducted a meta-analysis showing that DSM rates varied between 6.7% and 10.8%, depending on study size and follow-up duration. The relatively low morbidity rates associated with harvesting a limited number of grafts suggest that small donor site areas do not significantly impact knee function, especially when careful surgical techniques and appropriate donor site selection are employed. Donor site location is also critical in minimizing morbidity. Garretson et al. (20) demonstrated that harvesting from areas with lower contact pressures, such as the medial trochlea, can reduce the risk of degeneration and postoperative patellofemoral symptoms. Additionally, Andrade et al. (4) highlighted that DSM tends to be higher when grafts are harvested from high-load areas, such as the central

Table 5. Previous literature focused on DSM following autologous osteochondral graft harvesting from the knee

Author	Year	# patients	Follow-up (mean, months)	Outcome measure	Rate of DSM	Significant predictors of DSM
Reddy et al. (14)	2007	11	47	LKS	36.4% (4 out of 11 patients)	None identified
Iwasaki et al. (13)	2007	11	26	LKS, IKDC, MRI	0% reported, MRI shows fibrous repair	None identified
Paul et al. (10)	2009	112	55	WOMAC, LKS	Not specified numerically; higher BMI negatively influenced outcomes	Higher BMI, lower satisfaction
Nishimura et al. (7)	2010	12	24	LKS, VAS, muscle strength	No adverse effects on donor knee	Reduced extensor muscle strength at 3 months
Quarch et al. (15)	2014	37	Not specified	WOMAC, Tegner score, KSS, VAS	Up to 50%	Defects >3 cm^2
Fraser et al. (16)	2016	39	41.8	LKS, MOCART	12.5% at 24 months, 5% at final follow-up	Larger plugs lead to lower MOCART. No correlation between MRI findings and clinical outcomes
Nakagawa et al. (9)	2017	40	43.1	Knee symptoms, return to sport, radiological changes	15% (6 out of 40 patients)	None identified
Matsuura et al. (17)	2019	86	86	IKDC score, MRI findings	2.3% (usual), 12.8% (stricter)	Lower MOCART score
Guo et al. (18)	2022	46	98.3	LKS, MOCART	4.3% at 12 months, 0% at 24 months	None identified
Kurtuluş et al. (19)	2022	20	25.9	LKS, VAS, knee X-ray	20% (4 out of 20 patients)	Female, age >40 years, BMI ≥25, >1 graft
Current study	2024	52	36.2	LKS, knee X-ray	9.8% after 12 months	None identified

DSM: Donor site morbidity, LKS: Lysholm knee score, IKDC: International Knee Documentation Committee, MRI: Magnetic resonance imaging, WOMAC: Western Ontario and McMaster Universities Osteoarthritis Index, VAS: Visual analog scale, KSS: Knee Society Score, MOCART: Magnetic resonance observation of cartilage repair tissue trochlea, compared to those from lower-load regions. These findings underscore the importance of strategic donor site selection to mitigate mechanical stress and optimize patient outcomes. In terms of managing donor site defects, our study found that filling the defect with a collagen membrane did not lead to improved functional outcomes. This observation aligns with Quarch et al. (15), who reported that TruFit plugs did not significantly enhance clinical results despite promoting defect regeneration. Fraser et al. (16) similarly found no correlation between synthetic plug integration and improvements in LKS. These results suggest that for smaller donor site areas, natural healing processes may be sufficient, and additional defect-filling interventions may not provide measurable benefits. Combining these insights, it appears that DSM can be effectively minimized by limiting the number of grafts harvested, selecting donor sites with lower contact pressures, and recognizing that defect-filling strategies may not always be necessary. These considerations collectively support the safety and efficacy of osteochondral autograft procedures when performed with meticulous surgical planning and technique.

This study has several strengths. First, it includes a relatively large sample size of 52 patients (57 knees), which enhances the robustness of our findings. The long follow-up period (mean of 36.2 months) allows for an in-depth evaluation of the progression and resolution of DSM over time. Additionally, standardized outcome measures such as the LKS provide a consistent framework for assessing knee function, facilitating comparison with other studies. Including various demographic and clinical parameters (e.g., age, gender, BMI, number and size of grafts, and defect filling) enables a comprehensive analysis of potential predictors of DSM.

Study Limitations

Our study also benefits from a rigorous statistical approach, including linear regression analysis, to identify independent predictors of DSM. However, this study also has some limitations. The retrospective design introduces the potential for selection bias and limits the ability to establish causal relationships. The relatively small number of cases with DSM (9.8%) may have reduced the statistical power to detect subtle differences or correlations. Additionally, while the follow-up period was sufficient to observe functional recovery, it may not have been long enough to identify late-onset osteoarthritic changes. The study's reliance on a single institution may also limit the generalizability of the findings. Finally, the subjective nature of patient-reported outcomes like the LKS may introduce bias related to individual pain perception or activity levels.

Conclusion

DSM following osteochondral graft harvesting from the knee is relatively low, with the majority of patients achieving excellent functional outcomes within one year. Our findings indicate that factors such as age, gender, BMI, the number and size of grafts, and defect filling do not significantly influence DSM. These results suggest that careful surgical technique, including limited graft harvesting and strategic donor site selection, can mitigate potential morbidity. The consistency of our findings with existing literature reinforces the safety and reliability of autologous osteochondral grafting as a treatment option for cartilage defects. Further prospective studies with larger sample sizes and longer follow-up periods are recommended to confirm these results and explore additional factors that may influence DSM.

Ethics

Ethics Committee Approval: The University of Health Sciences Türkiye, İstanbul Training and Research Hospital Ethics Committee approved the study (approval number: 105, date: 08.11.2024).

Informed Consent: Informed consent was obtained from all participants.

Footnotes

Authorship Contributions: Surgical and Medical Practices - A.Ç.; Concept - A.A.; Design - A.Ç.; Data Collection or Processing - M.A.A., A.A.; Analysis or Interpretation - M.A.A., A.A.; Literature Search - M.A.A.; Writing - A.Ç.

Conflict of Interest: No conflict of interest was declared by the authors.

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