

# Ergonomics in hair restoration surgeons

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## Summary

**Background** Musculoskeletal disorders (MSDs) are potential sources of morbidity in hair restoration surgeons (HRS). This is particularly true for those who perform follicular unit extraction (FUE).

**Objective** To describe the nature, prevalence, and extent of ergonomic or work-related MSDs among HRS.

**Methods & Materials** A survey regarding MSDs was e-mailed to 100 HRS.

**Results** Thirty-eight HRS completed the survey, the majority of which were male and between the ages of 50–69. Fifty percent of respondents reported musculoskeletal symptoms occurring during or after hair restoration procedures. Reports of pain during and after surgery were higher for FUE procedures than single strip excision procedures. Pain/fatigue/discomfort persisted for longer following FUE procedures compared to strip excision procedures. MSD symptoms also negatively impacted quality of life. Although the majority of respondents felt that ergonomics was important, only 30% use ergonomic support when performing FUE procedures.

**Conclusion** Hair restoration surgeons should be aware of MSD symptoms and particularly when performing FUE. Symptoms reported included pain, fatigue, and discomfort, sometimes lasting several hours following surgery. More attention needs to be paid to ergonomics during hair restoration procedures in order to improve the quality of life of surgeons and ultimately prevent the development of MSDs.

**Keywords:** musculoskeletal disorders, prolonged static positions, follicular unit extraction, FUE, ergonomics

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## Introduction

Musculoskeletal disorders (MSDs) are a significant medical issue in healthcare professions where prolonged static positions, extensive use of upper extremities and wrists, or uncomfortable and awkward torso positions are required. The medical literature reveals an exten-

sive record of published material on MSDs in health professionals,<sup>1,2</sup> especially in the high-risk occupation of dentistry. Dentists are subjected to high rates of MSDs because of the requirement of fixed body postures or positions.<sup>3–5</sup> In many respects, the fixed body positions and ergonomics of hair restoration surgery and, in particular, of a surgical hair transplantation technique known as follicular unit extraction (FUE), are strikingly similar to those of dentistry.

There are two surgical techniques for hair transplantation surgery: (1) single strip excision with stereomicroscopic dissection and (2) FUE. Single strip excision

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is a well-established donor harvesting technique whereby the hair restoration surgeon (HRS) excises a single strip of tissue from the occipital portion of the scalp using a surgical scalpel and blade. Individual hair grafts are then created by skilled hair technicians who use stereomicroscopes to separate the naturally occurring follicular units from the excised scalp tissue. The grafts are then individually inserted by hand back into the alopecic areas of the scalp.

Follicular unit extraction, on the other hand, requires less technicians and greater physician skill sets when harvesting or obtaining follicular grafts for hair transplantation. Less office personnel is used because the naturally occurring follicular units or hairs from the scalp are individually excised by the physician operator. The grafts are implanted back into the scalp in like fashion as the strip excision technique. This donor harvesting technique is considered more ergonomically and physically demanding with more operator fatigue, prolonged static positions, and musculoskeletal discomfort reported anecdotally.<sup>6</sup>

There are two operator positions to assume during the donor harvesting portion for both FUE and strip procedures. One operator position is the standing or sitting position behind the patient who is seated in an upright sitting position in the procedure chair. The physician is typically at a lower position than the patient so to achieve donor harvesting of the patient's occipital scalp region with a handheld instrument looking at an upward angle. The second harvesting position consists of the patient positioned in the prone position on a surgical table, while the physician operator is standing or seated in a surgical chair facing the patient. In this position, the physician is usually at a higher position than the patient so to achieve donor harvesting of the patient's occipital scalp region with handheld instruments. Both the seated and prone patient positions require the physician operator to adjust their upper and lower extremities, cervical, thoracic, and lumbar spine to position their vision and view of the exiting angle of the hair follicle for successful scoring of the hair graft or removal of the strip from the scalp.

The FUE donor harvesting technique requires the upper and lower spine, and extremities of the physician operator to remain in a prolonged static position for up to 4–6 h with breaks approximately every 50 min. The operator grasps in their dominant hand a motor device containing a 1.0-mm circular sharp or blunt punch. As the punch rotates at a selected speed or rotations per minute (rpm), the appropriate physical touch is needed as the circular punch is positioned on

the skin's surface at the proper direction or angle over the exiting hair(s) with special vision magnification. A "blind" punch or scoring of the dermis is then attempted with the punch penetrating about 2.5–3.0 mm into the subdermis. This motion will then be repeated perhaps 1500–2000 times in a single case for successful harvesting of grafts.

Despite the similarity in ergonomics between dentistry and hair restoration surgery, there have been no studies examining the prevalence of MSDs in HRS. This study sought to characterize the frequency, nature, and severity of MSD symptoms in hair restoration surgeons and particularly in those physician operators using FUE donor harvesting technique.

## Methods

An electronic survey was emailed to a sample of 100 hair restoration surgeons who (1) were currently practicing hair restoration surgery and (2) had been practicing in the field for a minimum of 5 years. The sample was selected from a list of cosmetic and plastic surgeons actively practicing hair restoration surgery. The sample was selected from an email list of cosmetic and plastic surgeons actively practicing hair restoration surgery who attended a recent International Society for Hair Restoration Surgery (ISHRS) Annual Scientific Meeting. The survey invitation was emailed on two occasions. A reminder email was sent 2 months following this initial invitation to participate. There were no incentives to participate and no time limit for survey completion.

## Results

### Demographics

The questionnaire was sent to a total of 100 HRS of which 38 completed the survey. The majority of respondents were male and between the ages of 50–69 years. Eighty-two percent of respondents reported hair restoration surgery as their primary practice in the last 12 months and 62% worked in an individual/solo practice. Forty percent of surgeons had been performing hair restoration surgery for over 20 years. Respondents performed an average of 19.92 (SD = 6.73) hair restoration procedures per month (Table 1). Single strip excision was the most commonly performed procedure, followed by FUE-motorized, FUE-manual, FUE-robotic, and scalp reduction/flap rotation. Surgeons who performed FUE harvested an average of 1489 grafts per day (SD = 588, range 100–3400).

**Table 1** Demographic characteristics of respondents (*N* = 38)

	<i>N</i>	Percent
Age group		
30–39	3	8
40–49	9	23
50–59	11	28
60–69	14	38
70+	1	3
Sex		
Male	35	92
Female	3	8
Work environment		
Hospital Based	1	3
Individual	23	61
Small Group (2–3 physicians)	10	26
Large Group (4+ physicians)	4	10
Original training specialty		
Dermatology	8	21
General Surgery	8	21
Plastic Surgery	5	13
Primary Care	5	13
Emergency Medicine	4	10
Ear/Nose/Throat	3	8
Hair Restoration	3	8
Hematology/Oncology	1	3
Urology	1	3
Years in hair restoration surgeons		
5–9	5	13
10–14	9	24
15–19	9	24
20+	15	39

### Ergonomics

Surgeons (*N* = 32) reported spending 74% of the time standing vs. 26% of the time sitting during single strip excision procedures, while surgeons (*N* = 37) reported standing 41% of the time and sitting 59% of the time during FUE procedures. When performing hair restoration surgery with magnification, 55% of surgeons reported working 13–18 inches from the patient's scalp, 40% reported working 7–12 inches from the patient's scalp, and 5% reported working 19–24 inches from the patient's scalp.

### Characterizing musculoskeletal symptoms

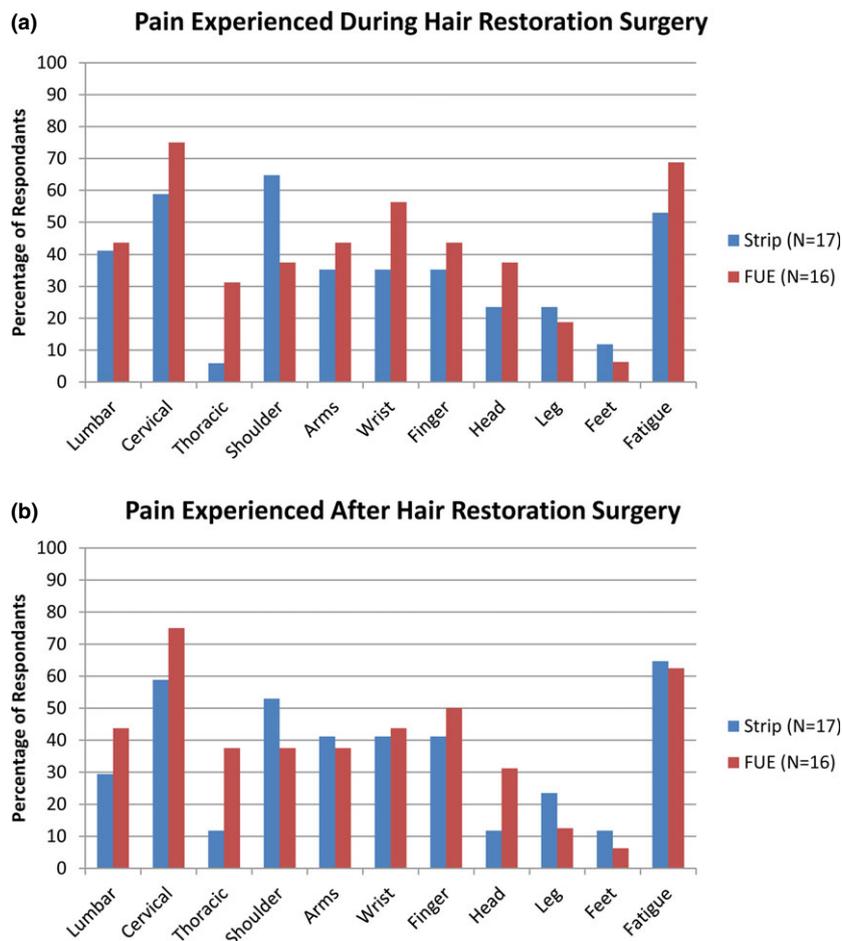
Fifty percent of surgeons experienced musculoskeletal symptoms in the past 12 months and reported experiencing these symptoms during or after performing hair restoration surgery. The majority of surgeons (79%) who reported musculoskeletal symptoms believed these symptoms were related to hair restoration surgery. The remainder of this section pertains only to those surgeons who reported musculoskeletal symptoms (*N* = 19).

Surgeons were asked to report the level of pain felt and the level of fatigue (none, mild, moderate, severe) during and immediately after either strip excision procedures or FUE-manual/FUE-motorized procedures. Some level of pain was reported for all anatomical areas. Cervical, thoracic, wrist, and head pain during hair restoration surgery were greater for FUE procedures than strip excision (Fig. 1a). Subjective pain experienced by physicians after hair restoration surgery was also greater for FUE procedures than strip excision in the same areas for during surgery with the addition of lumbar (Fig. 1b). Strip excision procedures appear to increase subjective pain experienced by physicians in the shoulder, leg, and feet areas more than FUE procedures, both during and immediately after surgery.

While it is clear that HRS experienced musculoskeletal pain, the potential differences between procedures became evident when responses were collapsed across anatomical area and categorized as none, mild, and moderate/severe. Sixty-nine (69%) percent of surgeons reported moderate/severe pain during FUE procedures, while only 35% of surgeons reported moderate/severe pain during strip excision procedures. Seventy-five (75%) percent of surgeons reported moderate/severe pain immediately after FUE procedures and 29% of surgeons reported moderate/severe pain immediately after strip excision procedures.

Surgeons reported fatigue with strip excision and FUE procedures, both during (strip: 53% vs. FUE: 69%, Fig. 1a) and immediately following surgery (strip: 65% vs. FUE: 63%, Fig. 1b). Fatigue during strip excision procedures was reported as “none” (47%) or “mild” (53%), while for FUE procedures, fatigue was reported as “none” (31%), “mild” (25%), or “moderate” (44%). Similar patterns were found for reports of fatigue immediately following surgery (strip excision: “none” 35%, “mild” 59%, and “moderate” 6%; FUE: “none” 38%, “mild” 19%, and “moderate” 44%, (Fig. 2).

The duration of pain, fatigue, and/or discomfort following strip excision and FUE procedures is displayed in Figure 3a,b. Ninety-four percent of surgeons reported that pain, fatigue, and discomfort persisted for up to 6 h following strip excision procedures, while 68% reported that symptoms persisted for the same duration of time following FUE procedures. However, 13% of surgeons reported that pain, fatigue, and/or discomfort persisted for 7–11 h following FUE procedures compared to 6% of surgeons following strip excision procedures. Symptoms further persisted for 12–23 h in 13% of surgeons and for longer than 48 h in 6% of surgeons following FUE procedures.



**Figure 1** Pain experienced by surgeons (a) during hair restoration surgery and (b) after hair restoration surgery.

### Quality of life

The impact of MSD symptoms on quality of life is depicted in Figure 4. Surgeons reported that MSD symptoms resulted in a mild or moderate limitation in upper extremity mobility, activities of daily living, and leisure time, while lower extremity mobility and emotional function were minimally impacted. Specifically, 74% of surgeons reported mild or moderate limitation in upper extremity mobility.

### Attitudes toward ergonomics

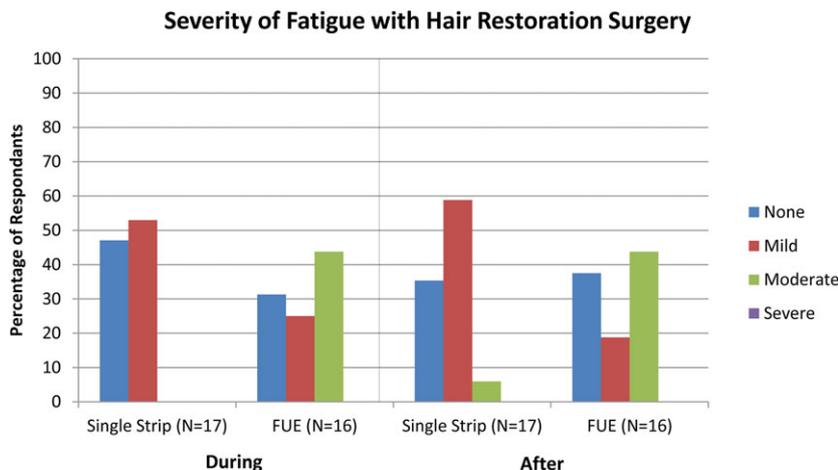
In general, all surgeons feel that ergonomics is important in hair restoration surgery ( $N = 38$ ). Ninety-one percent of surgeons reported being very concerned with ergonomics when they perform FUE donor harvesting with manual technique or a motorized device ( $N = 33$ ); yet, only 30% of surgeons use an ergonomic chair during these procedures ( $N = 37$ ).

Ninety-seven percent of surgeons believe ergonomics is an important area of study in hair restoration surgery as a whole.

### Discussion

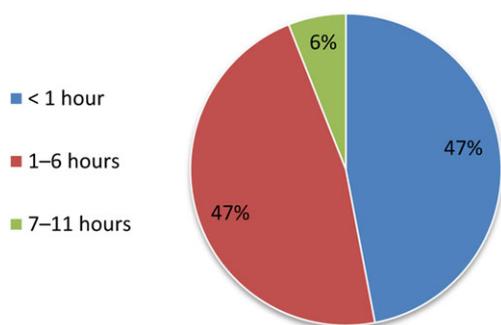
Mounting anecdotal evidence shows that HRS, especially those who have been in the profession for several years, suffer from symptoms of MSDs and that these symptoms are particularly problematic for those that perform the FUE transplant procedure. Some HRS have elected to discontinue handheld FUE and opt for robotic technology or reduce the number of grafts harvested per day to mitigate these symptoms. This is the first study, to our knowledge, that documents the nature, prevalence, and severity of MSD symptoms among HRS.

The response rate in this survey was low (38%). While this response rate prevents statistical analysis,

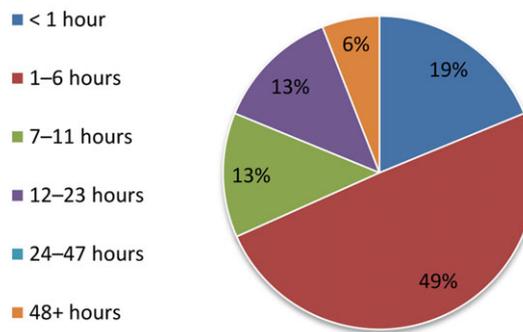


**Figure 2** Severity of fatigue with hair restoration surgery.

**Duration of Pain, Fatigue or Discomfort following a Single Strip Excision**



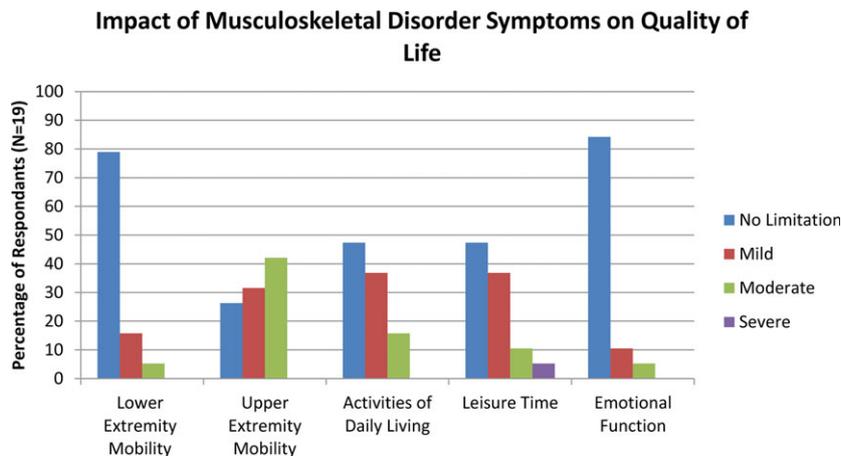
**Duration of Pain, Fatigue or Discomfort following a FUE Procedure**



**Figure 3** Duration of pain, fatigue, or discomfort following hair restoration surgery.

the results nonetheless suggest that MSD symptoms negatively impact hair restoration surgeons. A large number of respondents (50%) reported musculoskeletal symptoms, thought to be work-related, within the previous 12 months. Additionally, about three quarters of the respondents felt that there was mild to moderate limitation in upper extremity mobility as well as a decrease in their ability to perform activities of daily living. The results of this survey demonstrate that there is a negative impact on the musculoskeletal performance of HRS as a consequence of performing hair transplant surgery and in particular the FUE procedure.

The two most common procedures performed by HRS are the strip excision and the handheld FUE procedure. Both of these procedures are associated with intra-operative and postoperative pain, discomfort, and fatigue for the surgeon. It is the FUE procedure that typically causes greater musculoskeletal stress that may last 7–24 h postoperatively and, in a small proportion of respondents, even longer than 24 h. In individuals so affected, it is possible that they will have to reduce the frequency of hair restoration procedures that they perform, or even discontinue them altogether. Given the major sequelae of MSDs, it is even more important to consider preventative measures



**Figure 4** Impact of musculoskeletal disorder symptoms on quality of life.

such as more attention to ergonomics, including the use of an ergonomic chair. An alternative to the practice of handheld FUE is the incorporation of a robotic FUE device into the practice.

There has been increased attention in recent years to the health and well-being of healthcare personnel, including surgeons, dentists, dental hygienists, and ophthalmologists. Repetitive movements and awkward body and/or hand positions for prolonged periods of time are characteristic of all of these professions.<sup>1,2</sup> The current study demonstrates that the upper body and neck pain reported by these individuals is also experienced by hair restoration surgeons (HRS). The advent of the FUE surgical technique and its associated rigors, as well as the increased demand for hair transplantation surgery, has further highlighted the need for awareness, and prevention, of MSDs among HRS. To ensure exemplary care that patients expect to receive in this (and any) medical field, it is of paramount importance to ensure that the medical professionals caring for patients are equally well cared for. Increased awareness of MSDs in HRS will enable more study in this area and the development of strategies,

such as adopting ergonomic equipment, to reduce musculoskeletal stress in the practicing hair restoration surgeon.

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