

Nanofat and Platelet Rich Plasma to Enhance Recovery and Minimize Risk of Recurrence after Endoscopic Carpal Tunnel Release

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Abstract

Carpal tunnel release is one of the most common and surgery procedures performed. Complications and recurrence of the condition can occur up to 20% of cases. We describe a technique of utilizing the nanofat and platelet rich plasma to successfully enhance healing and minimize risk of recurrence after endoscopic carpal tunnel release. This patient had exceptionally fast recovery, resuming work in one day and excellent grip strength and a full functioning level at his two-week follow-up. After one year he continues to demonstrate a complete resolution of symptoms and full function without any evidence of recurrence or complications.

Keywords

Carpal Tunnel, Nanofat, Platelet Rich Plasma

1. Introduction

Carpal tunnel syndrome is the most common nerve compression disorder in the upper extremity. The prevalence of this condition is as high as 7.8% within the United States working population [1]. The incidence of carpal tunnel surgery is 108 per 100,000 person-years [2]. Complications and failures can occur in 3% - 19% of patients undergoing primary carpal tunnel release [3] [4]. Revision carpal tunnel release may be required in up to 12% of these patients [5] [6]. Nancollas *et al.* reported 57% of patients noted a return of preoperative symptoms within 2 years after carpal tunnel surgery [7]. Causes for a failure of the primary surgery and subsequent recurrence include an incomplete release of the transverse carpal ligament, adhesions of the median nerve and tenosynovitis [8]. Scarring around the nerve is the most difficult condition to treat as this often requires neurolysis

and typically has a poor outcome compared to the results after the primary surgery due to the recurrence of additional scar tissue [9]. This article describes a novel technique of utilizing autologous fat tissue (nanofat) and platelet rich plasma (NeuroRejuvenation®) around the nerve and in the wound at the time of the primary procedure to enhance wound healing and decrease the risk of scar tissue and subsequent recurrence.

2. Case Report

Informed consent was obtained from the patient prior to reporting this case of a 58-year-old male with a history of numbness for ten years. He describes the symptoms worsening over the last couple of years. He had failed conservative management. On examination, he had decreased sensation to the median nerve distribution as well as thenar atrophy. An ultrasound examination was performed which demonstrated enlargement of the median nerve within the carpal tunnel measuring 18 mm². This measurement was consistent with a severe carpal tunnel syndrome. We did not demonstrate any abnormal anatomy such as a bifid median nerve or a persistent median artery which would affect our visualization during an endoscopic release. A nerve conduction study was also performed which demonstrated findings consistent with a severe right carpal tunnel syndrome with a sensory distal motor latency of 6.55 ms (milliseconds) and a distal motor latency of 8.35 ms (milliseconds). We discussed options and due to his severely lack of improvement with any conservative management he wished to proceed with surgical intervention.

The patient underwent an endoscopic carpal tunnel release (EndoTech®) under local anesthesia. Fat harvest was performed via liposuction from the patient's abdomen with tumescent fluid under local anesthesia. This tissue was then placed into two syringes and using connectors we repeatedly pressed this tissue from one syringe to the next 20 times. The mechanically emulsified fat tissue obtained was then placed in the centrifuge (MediKhan). The resulting fat tissue was then ready for use into the wound and around the nerve using an 18-gauge Angiocath needle. We also obtained whole blood from an intravenous cannula. This blood was placed in a centrifuge (Emcyte) to obtain the platelet rich plasma which was placed around the nerve and in the wound using an 18-gauge Angiocath needle. The carpal tunnel release site and abdominal wounds were then dressed with sterile dressings. He was discharged with a guideline for utilizing nonnarcotic pain medications.

The patient was then seen for a follow-up visit 15 days after the procedure. He did not require any prescription pain medications and was able to resume work the next day which involved a desk job activity. On examination, he had minimal discomfort and had full range of motion with a grip strength of 65 pounds. He did not require any formal therapy and could perform unrestricted activities. He was then followed up after 13 months via a phone call at which time he completed a quick-evaluation. His QuickDash score was 0 out of a possible 100 with 0 being no symptoms or limited function and 100 being the worst possible

symptoms and limitation of function. He rated his overall experience as very satisfied, denying any numbness or discomfort to the right hand. During his treatment course there was no evidence of any complications or infections.

3. Discussion

Failure after the initial carpal tunnel release can occur in up to 19% of patients which may require revision surgery [3] [4]. Secondary procedures for recurrent carpal tunnel syndrome often have less improvement than after a primary surgery. Improvement can occur in 80% of patients after revision surgery, however, up to 20% may remain unchanged and 10% of who may require a third operation [10]. Authors have reported up to 40% poor results and 95% with persistent symptoms after re-exploration [11] [12]. Operative findings of circumferential fibrosis around the median nerve often lead to a poor result postoperatively [10]. Several procedures and various implants have been used to minimize the risk of adhesions during peripheral nerve surgery. These include fat tissue transfer, hypothenar fat pad, collagen materials, amniotic tissue, Seprafilm and Interceed [13]-[24]. Authors have recently utilized a nerve barrier during a primary procedure with a significant improvement in outcomes and reduction in recurrence rate [25]. Another group is currently using interceed to cover the median nerve during primary carpal tunnel release as they have so far experienced excellent results [19]. The hypothenar fat pad is also being used during the primary surgery for end stage carpal tunnel syndrome to improve nerve regeneration and decrease risk of recurrence [26]. In a prospective study comparing an open carpal tunnel release with and without hypothenar fat pad, there was improved function and symptom score on the BCTQ with those patients having the additional fat pad placed over the nerve compared to those who did not have this additional procedure, but this was not statistically significant due to the low number of patients in the study [22].

This case report demonstrates the safety and effectiveness of utilizing a nano-fat technique along with platelet rich plasma to enhance the healing and minimize risk of recurrence after a carpal tunnel release surgery. This patient was able to resume work activities the next day and by first follow-up had excellent grip strength and minimal discomfort. His grip strength measured 65 pounds which is greater than the 20 pounds required for functional activity. After 1 year follow-up he demonstrated lowest possible score possible (least amount of symptoms and highest level of function) on his QuickDash patient rated outcome questionnaire and was doing exceptionally well with no evidence of recurrence. Post-operative scar tissue is the most common cause for failure and recurrence of carpal tunnel syndrome. This procedure improves wound healing and stimulates faster recovery while decreasing the likelihood of post-operative scar tissue. The technique presented here improves outcomes after carpal tunnel release and decreases the costs and morbidity associated with recurrence carpal tunnel syndrome.

4. Conclusion

In conclusion we present a technique of utilizing autologous tissue including nanofat and platelet rich plasma to enhance the recovery and decrease the risk of recurrence following a carpal tunnel release. This technique is a very safe and effective technique to enhance the healing and minimize risk of complications or revision following an extremely common surgical procedure. We are currently evaluating this procedure with a case control series to compare the endoscopic technique with and without the nanofat and platelet rich plasma technique.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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