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Original Article

Psychological Aspects of Nerve Gap Reconstruction: Addressing Patient Perspectives and Expectations



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Purpose: Preoperative expectations play a major role in determining patient satisfaction after surgery. The aim of this study was to characterize patient's preoperative expectations and postoperative perceptions of nerve gap repair surgery.

Methods: We conducted a search of Embase, Scopus, and Web of Science databases for peer-reviewed articles that studied patient expectations, perceptions, and impressions of nerve gap repair in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Studies related to lumbar plexus radiculopathy, reimplantation, or patient satisfaction scores without patient testimony were excluded. Primary and secondary outcomes were patient's preoperative expectations and postoperative perceptions of nerve gap repair surgery, respectively.

Results: We included 11 studies evaluating a total of 462 patients. One study evaluated only patient expectations, six studies evaluated only patient perspectives, and four studies evaluated both. Patients were generally overly optimistic in their expectations of surgery. Postoperative satisfaction ranged from 82% to 86%, and 81% to 87% of patients would choose to undergo their surgery again knowing what they know now.

Conclusions: Patient expectations in nerve gap repair are optimistic, and at times unrealistic. Patient satisfaction with nerve gap repair is high and subject to influence from preoperative education and postoperative outcomes of functional and sensory recovery.

Clinical relevance: Surgeons should be aware that patient expectations of their postoperative outcomes can have substantial impacts on their perceived management and overall satisfaction. More emphasis should be placed on preoperative education and expectation management to optimize patient satisfaction.

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Nerve injuries can arise from multiple etiologies^{1,2} with devastating outcomes. Patients are often left with functional limitations and sensory dysfunction, as well as excruciating pain.³ Patient symptoms often correlate with injury severity along a continuum from isolated demyelination to complete transection or root avulsion.⁴ Patients with large gaps between the proximal and distal segments of uninjured nerve after resection are at increased risk of long-term complications and worse overall outcomes.⁵ Surgical strategies such as direct repair, nerve grafting, and distal nerve transfers can be effective at providing resolution of symptoms, but

wide variability still exists in success.^{6–8} Furthermore, although autograft reconstruction is considered the gold standard of care,^{9,10} it is not without fault and requires additional consideration due to complications that can arise at the donor site.^{11,12} As such, each repair method has its own unique indication based on the size of the nerve gap,¹³ ability to avoid tension,^{14,15} and innate differences between nerves, such as fascicle density,¹⁶ that make nerve repair unique to each individual patient.

Aside from the biologic challenges of nerve regeneration, increasing attention is paid to the influence that psychosocial factors have on recovery after nerve injuries such as brachial plexus injuries.^{17,18} Patient perspectives and expectations for recovery may play a critical role in how a patient interprets their ultimate outcome.^{19–21} This has been demonstrated in other fields such as neurosurgery,²² and failure to achieve desired results has been

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shown to mitigate satisfaction in favor of disappointment.^{23,24} Because of this, it is important for surgeons and therapists treating patients with nerve injuries to be aware of what patients' preoperative expectations are and how they perceive their outcomes following surgery. Patient perspectives have already been evaluated in joint arthroplasty^{25–35} and nerve decompression.^{36–38} However, there is a distinct disparity in available literature regarding patient expectations and perspectives on peripheral nerve gap repair.

Our purpose was to characterize patient experiences with nerve gap repair, with a specific focus on preoperative expectations and postoperative perceptions. In this systematic review, we asked the following questions: (1) what are patient expectations before undergoing nerve gap repair and (2) what are patient perceptions of nerve gap repair with regards to preoperative education, management, postoperative outcomes, and donor-site complications?

Materials and Methods

Eligibility criteria

We conducted a systematic review of the peer-reviewed literature reporting patient expectations, perceptions, and impressions of peripheral nerve reconstruction in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Only full-text articles published in the English language were included. Studies involving animals, lumbar plexus radiculopathy, brachial plexus injuries, spinal cord injuries, reimplantation, and patient satisfaction/PROMIS/DASH scores without patient testimony were excluded. Articles concerning nerve surgery but not nerve gap repair such as decompression or neurotomy were excluded. Studies that included iatrogenic nerve injury patients with intraoperative repair were not included. Additionally, all commentaries, letters to the editor, editorials, machine-learning studies, and conference proceedings were excluded.

Search strategy

A search was performed using the Embase, Scopus, and Web of Science databases. Two independent reviewers conducted the search, and the senior author was available to review any discrepancies, but none arose that required arbitration. Key words were used in varying combinations to broaden the search and are as follows: (('nerve surgery'/exp OR ('peripheral nerve'/exp AND 'surgery'/de)) OR ((nerve* NEAR/2 repair*) OR (nerve* NEAR/2 transfer*) OR (nerve* NEAR/2 autograft*) OR (nerve* NEAR/2 allograft*) OR (nerve* NEAR/2 conduit*) OR (nerve* NEAR/2 graft*) OR (nerve* NEAR/2 reconstruction*) OR (nerve* NEAR/2 surger*)):ti,ab AND ('patient satisfaction'/exp OR ((patient* NEAR/2 satisfaction) OR (patient* NEAR/2 perception*) OR (patient* NEAR/2 expectation*) OR (patient* NEAR/2 assumption*) OR (patient* NEAR/2 presumption*) OR (patient* NEAR/2 belief*) OR (patient* NEAR/2 projection*) OR (patient* NEAR/2 prediction*) OR (patient* NEAR/2 awareness) OR (patient* NEAR/2 understanding) OR (patient* NEAR/2 judgment*) OR (unrealistic NEAR/2 expectation*) OR (erroneous NEAR/2 expectation*) OR (unreasonable NEAR/2 expectation*) OR (recovery NEAR/2 expectation*) OR (ambitious NEAR/2 expectation*)):ti,ab) AND [english]/lim NOT (('conference abstract' OR 'conference paper'):it OR ('conference paper'/exp OR 'conference abstract'/exp)). Additionally, the reviewers assessed the references of the included articles for any additional studies.

Data extraction

Studies reporting patient expectations, perceptions, and impressions of their nerve gap repair were included if their data were directly related to their nerve gap repair and not secondary to other surgeries or aspects of care; data extraction was limited to patients with nerve gap repair and their respective opinions. Study characteristics, patient demographics of mean age, sex, race, and type of repair were included.

Selection process and studies included

In total, 1,153 articles were identified in the initial search. After removing 264 duplicates, we screened 889 articles by title and abstract. In total, 849 records were excluded, and the full texts of 40 articles were queried. Of the 40 full-text articles reviewed, 4 were not retrievable, and 25 did not meet inclusion criteria, for a total of 11 papers (Fig. 1).

Statistical analysis

Descriptive statistics are used to report the findings. Sex is described using numbers and percentages, given that it is a categorical variable. All analyses were completed in Excel (Microsoft Corp).

Results

Study characteristics

In total, 11 articles were included in our analysis. Study designs included three retrospective cohort studies, six cross-sectional studies, and two mixed methods studies, consisting of 462 patients (424 nerve gap repairs). Patient age was reported as a mean in 10/11 studies and as an age range in 1/11. Additional age information was available as SD in four studies and age ranges in five studies, with ages ranging between 6 and 72 years. Sex was reported in nine studies for 338 patients consisting of 243 (71.9%) men and 95 (28.1%) women. Eight studies evaluated autograft reconstruction, four evaluated direct surgical repair, and two included nerve transfer (Tables 1 and 2). One study did not specify the type of nerve gap repair (Table 1). Four articles evaluated patients with concomitant brachial plexus injuries (Table 1), and three studies evaluated donor-site perceptions (Table 2). One study evaluated patient expectations only, six studies evaluated only patient perspectives, and four studies evaluated both (Tables 1 and 2).

Expectations

Patient expectations were tied to functional and sensory outcomes.³⁹ Following an education module, incorrect expectation responses were still reported for motor recovery, postoperative pain, and timing of recovery at rates of 30%, 31%, and 40%, respectively, with trends in error reporting being overly optimistic and unrealistic.³⁹ When preoperative expectations were evaluated as achievement of desired outcome, desired motor recovery was achieved more frequently in the median nerve than ulnar nerve. Patients younger than 16, those with lower-level lesions, and those at their 18- to 24-month follow-up met preoperative expectations more frequently than those older than 40 years, those with higher-level lesions, and patients at their <10 or 10–18 months of follow-up.⁴⁰

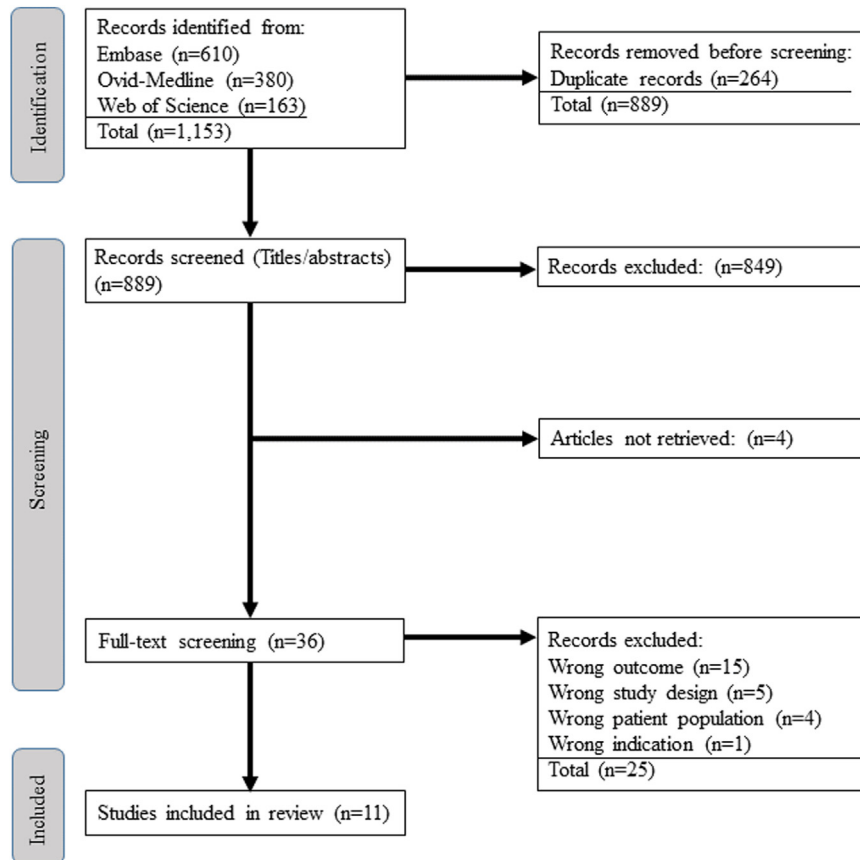


Figure 1. Identification of studies via databases and registers.

Table 1
Article Characteristics of Studies Evaluating Nerve Gap Repair

| Study | Study Design | Number of Patients | Operated Nerve | Type of Nerve Gap Reconstruction | Patient Perspective or Expectation | Other Outcome Measures |
|------------------|--|--------------------|--|---|------------------------------------|---|
| Ayhan et al | Retrospective | 25 | Digital | Direct repair | Patient perspective | Sensation loss (VAS/2PD/SWM/cold intolerance) |
| Kirsch et al | Cross-sectional | 60 | Brachial plexus/ peripheral nerve disorders | Not specified | Expectation | Before and after educational handout |
| Rasulić et al | Retrospective + cross-sectional survey | 69 | Brachial plexus | Autograft and nerve transfer | Expectation and perspective | Function (LSUMC grading system), change in employment, and DASH score |
| Chemnitz et al | Cross-sectional | 15 | nine Median, one ulnar, five both | Autograft and direct repair | Patient perspective | DASH, CISS, VAS, SOC, and professional impact |
| Dy et al | Cross-sectional | 15 | Brachial plexus | Autograft and nerve transfer | Patient perspective | None |
| Kretschmer et al | Cross-sectional | 70 | Brachial plexus | Not specified | Expectation and perspective | DASH, employment impact, back pain, and depression/anxiety |
| Göransson et al | Retrospective | 37 | Spinal accessory | Neurolysis, nerve repair, or nerve grafting | Expectation and perspective | Active ROM, atrophy, pain, and occupational impact |
| Nouraei et al | Retrospective + cross-sectional survey | 54 | 38 Medial and 32 ulnar | Nerve repair and nerve grafting | Expectation and perspective | MRCS sensory and motor recovery |

Perspectives

Patients' decisions to undergo nerve repair were influenced by not only potential improvement in function but also fear of losing recovery they had already made.⁴¹ Patient sentiments often resembled being happy with the recovery they had made and prioritized making the most of their situation without further improving function through surgery.^{41,42} Patients noted a lack of available educational resources and the desire to speak more with their physician before making their decisions, citing a desire for

“clear and honest” information about anticipated consequences and prognosis.⁴² Additionally, notable sources of frustration with the nerve repair process were lapses in social and family support.^{41,42}

Satisfaction rates of those who underwent nerve gap repair were between 82% and 86%.^{41,43} Patient satisfaction was tightly associated with postoperative function,^{43–45} pain,^{43,45} and neurological/sensory recovery.⁴³ Motor function was also determined to be more important for patient satisfaction than sensory recovery.⁴⁴ Ultimately, 81% to 87% of patients reported that they would choose

Table 2
Paper Characteristics of Studies Evaluating Donor-Site Morbidity

| Study | Study Design | Number of Patients | Operated Nerve | Type of Nerve Gap Reconstruction | Patient Perspective or Expectation | Other Outcome Measures |
|------------------|-----------------|--------------------|----------------|----------------------------------|---|--|
| Staniforth et al | Retrospective | 45 | Not specified | Nerve grafting | Patient perspective on donor site morbidity | Time to weight bearing, surgical complications |
| Ehretsman et al | Cross-sectional | 31 | Not specified | Nerve grafting | Patient perspective on donor site morbidity | Numbness, pain, and cold insensitivity |
| Hallgren et al | Cross-sectional | 41 | Not specified | Nerve grafting | Patient perspective on donor site morbidity | VAS, pain, and reconstructed nerve effects |

Table 3
Patient Satisfaction and Willingness to Reundergo Nerve Gap Repair and Associated Factors

| | Nerve Repair | Satisfaction Rate | Factors Associated With Satisfaction | Would Choose to Undergo Surgery Again |
|------------------|--|---|---|---------------------------------------|
| Dy et al | Brachial plexus nerve transfer ($n = 10$), brachial plexus nerve graft ($n = 6$) | 86% (Reported satisfaction and overall happiness in life) | Strong family support, sense of purpose | Not reported |
| Rasulić et al | Brachial plexus nerve transfer ($n = 74$), brachial plexus nerve graft ($n = 37$) | 82.6% | Better neurological outcome, higher injury severity | 81.2% |
| Ayhan et al | Direct repair of digital nerve ($n = 25, 31$ nerves) | Median VAS score of 60 | Decreased cold intolerance, better motor function | Not reported |
| Göransson et al | Direct repair of spinal accessory nerve ($n = 9$), sural to spinal accessory nerve graft ($n = 4$) | Two reports each of “excellent,” “good” and “poor,” and six reports of “fair” overall satisfaction with upper extremity | Greater strength, less winging of scapula, less pain, greater subjective function | Not reported |
| Kretschmer et al | Unspecified brachial plexus surgery ($n = 70$) | 83% | None | 87% |

to undergo their surgery again, given their preoperative status and current outcomes (Table 3).^{43,46}

In autograft patients, sural nerve donor-site satisfaction was associated with overall nerve transfer satisfaction and was not a standalone source of repair dissatisfaction.^{47,48} Scar cosmesis was assessed in two studies and found to have no association between gender and scar cosmesis/discomfort,^{47,49} and no relation was noted between, scar location, age, or operated extremity and perceived recovery.⁴⁷

Discussion

In our systematic review of the published literature, we found that patient expectations prior to nerve gap repair are often unrealistically high and subject to influence depending on patient characteristics and patient perspectives are overall positive toward their surgery with high satisfaction rates and willingness to repeat the process again. However, more research is suggested in order to further characterize the patient experience with nerve gap repair. Future work should aim to understand the rationale and contributors to patient expectations, which would help in designing patient-specific educational interventions and counseling to set appropriate expectations.

Managing patient expectations is crucial to achieving successful outcomes,⁵⁰ as patient expectations can impact their perception of care, management,⁵¹ surgeon competence,⁵² and postoperative outcomes.^{53–55} High patient expectations can have a variety of results, from total dissatisfaction to improved outcomes following surgery.^{56,57} Among nerve gap repair patients, expectations were notably high before undergoing operative repair,^{58,59} with no distinct differences between type of repair and outcome satisfaction. There was additionally a distinct lack of standardization among studies reporting patient expectations and perceptions and argues for the need within peripheral nerve surgery for validated evaluation tools for patient expectations and perceptions. Such surveys/questionnaires for the evaluation of general surgical and total joint specific expectations already exist,⁶⁰ and development of

one specific to peripheral nerve repair is necessary for guiding future management, given its unique etiology and recovery. Furthermore, patient expectations often stagnate from their first impression but have been shown to change following further information acquired through interaction with their surgeon.⁶¹ One study reported patient concerns regarding preoperative education materials,⁴² and the high rate of erroneous expectations despite educational intervention³⁹ pose new questions as to the impact of health literacy and the quality of information they are provided.^{62,63} With clear evidence that improved education improves outcomes^{64,65} and satisfaction,⁶⁶ further investigations should be conducted into what information is missing from preoperative discussions in order for patients to make knowledgeable and accurate outcome predictions.

Despite evidence that unmet expectations can mitigate outcome satisfaction,^{23,24} patients ultimately reported high levels of satisfaction (82% to 86%)^{41,43} and willingness to undergo their operation again if given the choice (81% to 87%).^{43,46} These findings suggest that although patients' impression of nerve repair is positive overall, approximately one in every seven patients is dissatisfied with some aspect of their care. Factors influencing patient dissatisfaction included lack of desired functional recovery,⁴⁴ pain,⁴⁷ neurological outcomes,⁴³ and scar cosmesis in autograft patients.⁴⁹ Further investigation into unknown causes of dissatisfaction or differences in satisfaction rates such as demographics and socioeconomic standing has only been minimally explored within nerve gap repair. Studies included in our analysis evaluated only sex, age, and surgical scar location,^{47,49} with no mention of economic standing such as income, employment, or insurance status. Given the numerous points of potential intervention identified through current literature, addressing overall patient satisfaction poses a very large and complex problem with no singular solution. However, smaller steps have already been taken in the pursuit of better patient management, such as addressing complications from nerve grafting by reducing overall scar burden through less invasive procedures.^{67,68} Approaches such as these in combination with better education and patient management demonstrate how the

pursuit of increased patient satisfaction is an evolving field of interest and requires a collaborative effort across multiple specialties.

Like all systematic reviews, our conclusions are limited by the strengths and weaknesses of the studies included in our review. Furthermore, limitations of our work include using only three databases for the initial literature review. However, the impact of this limitation was mitigated by screening paper bibliographies/references for any additional studies not initially included. Although most (8/11) studies were cross-sectional qualitative evaluations of patient experiences, a lack of standardization was noted among reports for outcome expectations, level of satisfaction, and patient perceptions of support, education, and outcome. There was further heterogeneity in the reporting of patient outcomes of function, sensory recovery, pain, and satisfaction which limited analysis.

Patient expectations of outcomes following nerve gap repair are overly optimistic, and adjustment of these expectations to fit historical outcomes is necessary to improve patient satisfaction. This process begins with an effective physician–patient relationship, establishment of patient priorities, and providing adequate education in formats that patients of different learning styles and health literacy levels can understand. Further investigation into the reasoning behind perspectives on different outcomes following nerve gap repair is necessary in order to properly care for patients.

Conflicts of Interest

No benefits in any form have been received or will be received related directly to this article.

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