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# The role of elective amputation in patients with traumatic brachial plexus injury



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## KEYWORDS

Brachial plexus injuries;  
Upper extremity injury;  
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**Summary** *Background and aim:* Despite undergoing complex brachial plexus, surgical reconstructions, and rehabilitation, some patients request an elective amputation. This study evaluates the role of elective amputation after brachial plexus injury.

*Methods:* A retrospective chart review was performed for all the 2140 patients with brachial plexus injuries treated with elective amputation between 1999 and 2012 at a single institution. Analysis was conducted on the potential predisposing factors for amputation, amputation level, and postamputation complications. Patients were evaluated using pre- and postamputation Disabilities of the Shoulder, Arm, and hand scores in addition to visual analog pain scores.

*Results:* The following three conditions were observed in all nine patients who requested an elective amputation: (1) Pan-plexus injury; (2) non-recovery (mid-humeral amputation) or elbow flexion recovery only (forearm amputation) 1 year after all other surgical options were performed; and (3) at least one chronic complication (chronic infection, nonunion fractures, full-thickness burns, chronic neck pain with arm weight, etc.). Pain improvement was found in five patients. Subjective patient assessments and visual analog pain scores before and after amputation did not show a statistically significant improvement in Disabilities of the Shoulder, Arm, and Hand Scores. However, four patients reported that their shoulder pain felt “better” than it did before the amputation, and two patients indicated they were completely cured of chronic pain after surgery.

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**Conclusions:** Elective amputation after brachial plexus injury should be considered as an option in the above circumstances. When the informed and educated decision is made, patients can have satisfactory outcomes regarding amputation.

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## Introduction

Adult traumatic brachial plexus injuries can have devastating effects on the upper extremity function.<sup>1</sup> Despite increased experience in the management of these injuries, optimal management is considerably being debated at present.<sup>2</sup>

For the past 50 years, data on the elective amputation in patients with brachial plexus injuries have been documented. In 1961, Yeoman and Seddon<sup>3</sup> reported 36 patients treated for flail arm in brachial plexus. Reconstructions versus amputation and shoulder arthrodesis versus no treatment were compared. A better functional result was observed with amputation–arthrodesis as opposed to reconstruction or no operation. In 1977, Ransford and Hughes<sup>4</sup> reviewed 20 patients, 13 of whom were amputated after brachial plexus injuries. Amputation did not relieve pain and prostheses were not frequently used. In 1980, Rorabeck et al.<sup>5</sup> published a study of 23 patients with complete brachial plexus lesions and three treatment approaches: no surgery, amputation, and amputation with shoulder arthrodesis. The ability to return to employment and wear a prosthetic device were best achieved with early amputation. In 2005, Bedi et al.<sup>6</sup> described their combined glenohumeral arthrodesis and above-elbow amputation technique for the flail limb following a complete post-traumatic brachial plexus injury. According to their clinical experience, the combination of these procedures consequently improved the pain level, enhanced shoulder stability, encouraged functional rehabilitation via prosthetic fitting, and was associated with high patient satisfaction.

However, some other authors have published series with a lower rate of elective amputation as treatment for brachial plexus injuries. In 1978, Narakas<sup>7</sup> published a series of 508 patients with traction injuries of the brachial plexus over a period of 11 years. Only three secondary amputations were reported. In 1982, Sedel<sup>8</sup> recorded no amputations in his 139 cases. In 1988, Allieu et al.<sup>9</sup> published a series of 28 patients with complete brachial plexus paralysis after at least 4 years of follow-up. According to these authors, the preservation of the limb was always preferable to amputation, which was only requested by one patient. A series of 750 patients was published by Wilkinson et al.<sup>10</sup> Elective amputation was performed in 13 cases at the patient's request and as a possible element of rehabilitation. The pain of preganglionic injury was not relieved by amputation. According to Terzis et al.,<sup>2</sup> in a more recent paper, amputation should no longer be considered an option even when faced with global root avulsion.

In view of all these reports, the aim of this study was to critically evaluate the adjunctive role of amputation in

patients with brachial plexus injury as assessed by a multidisciplinary brachial plexus team. An evaluation was performed on the potential predisposing factors, complications, and clinical outcomes after the amputation surgery.

## Materials and methods

After approval by our Institutional Review Board, a retrospective review of patients with brachial plexus injuries treated with elective amputation following reconstructive surgery for their brachial plexus injury was completed. Patients were included in the study if they had had a brachial plexus injury and had undergone elective amputation afterwards. Before the amputation surgery, patients had been subjected to a variety of brachial plexus reconstructions based on the type of injury (pre- vs. post-ganglionic), the time that had passed since the injury, and the patients' own preferences (Table 2). All the patients underwent the amputation procedure between 1999 and 2012. Medical records were reviewed for patient demographic data and pre-amputation situations (type of injury, type of reconstruction, the time that had passed since the injury, motor recovery, and complications). Using

**Table 1** Patient demographic data, occupation, and marital status.

Patient	Age (y)	Sex	Occupation before	Occupation after	Marital Status
1	25	Male	Sanitation worker	Disabled	Single
2	42	Male	Truck driver	Company technical support	Married <sup>a</sup>
3	45	Female	Casino manager	Unemployed currently	Married
4	32	Male	Fire fighter	Disabled	Married
5	28	Female	Factory worker	Disabled	Single
6	37	Male	Construction worker	Construction work	Single
7	26	Male	Border patrol	Highway patrol dispatcher	Single
8	34	Male	Construction worker	Disabled	Married <sup>a</sup>
9	28	Female	Truck driver	Counselor	Single

<sup>a</sup> Divorced after injury.

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