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Late shoulder-arm morbidity using ultrasound scalpel in axillary dissection for breast cancer: a retrospective analysis

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ABSTRACT

Background: We aimed to assess whether the use of the harmonic scalpel (HS) in axillary dissection would reduce long-term shoulder-arm morbidity compared to traditional instruments (TIs).

Materials and methods: A retrospective analysis on 180 patients who underwent standard axillary dissection for breast cancer between 2007 and 2015 was carried out. All patients were evaluated for postoperative pain, impairment of shoulder-arm mobility, seroma formation in axilla, frozen shoulder, and lymphedema.

Results: HS procedure on average was 50% shorter compared to the TI technique. HS reduced by 4.5 times the risk of axillary seroma. TIs were associated with 4 times higher risk of developing a painful frozen shoulder.

Conclusions: Use of the HS was associated with reduced costs and a positive long-term effect on shoulder-arm morbidity. Axillary seromas are not the only reason of later postoperative shoulder-arm morbidity: other mechanisms are hypothesized in the onset of this very disabling disorder.

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Introduction

Sentinel node (SN) biopsy is the gold standard for treatment of early breast cancer because it allows for accurate staging of the axilla.[1-3] SN biopsy is cost effective, is associated with a shorter operative time, and should decrease postoperative morbidity. In fact, postoperative shoulder-arm morbidity is less severe following SN biopsy compared to standard axillary dissection.[4,5] Axillary node dissection is sometimes used for the treatment of breast cancer; however, about 30% of patients develop shoulder-arm morbidity postoperatively.[6-8] Axillary seroma is the most common immediate complication. The main causes of seroma collection after axillary dissection are leakage from incomplete obliteration of the lymphatic ducts and thermal effect on the tissues with lipolysis and inflammatory reaction. Pain, numbness, impairment of mobility and

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strength, lymphedema, and frozen shoulder are the major long-term shoulder-arm problems.[9,10] The pathogenesis of these late complications is uncertain, but extreme abduction, arm position, nervous lesions, seroma formation, and prolonged postoperative immobilization of the shoulder remain the main causes.[11] Axillary dissection can be performed with different surgical techniques and with almost overlapping results.[12-15] Therefore, the aim of the present study was to assess the role of the harmonic scalpel (HS) in the reduction of long-term shoulder-arm morbidity compared to traditional scalpel, scissors, ligations, and electrocautery in axillary dissection.

Patients and methods

Data from 180 patients treated with standard I-II level axillary dissection for breast cancer in our Surgery Unit, University of Campania, Naples, Italy, between January 2007 and December 2015, were retrospectively assessed. After surgery, all patients underwent routine oncologic and surgical follow-up. They were examined to assess postoperative morbidity by blinded physicians not belonging to the surgical team. Follow-up data were collected every 3 mo for 2 y, every 6 mo for 5 y, and then once every year. For evaluation of arm lymphedema, that is, volume change, measurement of the circumference (in cm) of the arm (upper arm and forearm) was carried out 15 cm above and 10 cm below the lateral epicondyle, and the mean of three measurements was used. Measurements were taken on both arms, using the untreated arm as control. Lymphedema was defined as $\geq$ 10% volume difference. The effect on shoulder-arm mobility was assessed by asking patients to elevate the operated arm over their head to the other shoulder, to move the arm back and forth, to move the arm behind the back to reach the other scapula, and to perform internal and external arm rotation. The range of motion was measured with a goniometer (Isomed Inclinometer; Portland, Oregon).[16] The objective criteria were compared between the operated and the contralateral side. Motion restriction was recorded using a scale from 0 to 3 (0, $<10^\circ$ = no motion restriction; 1, 10°-25° = mild restriction; 2, $>25^\circ$-50° = moderate restriction; and 3, $>50^\circ$ = severe restriction). Shoulder-arm pain was evaluated using a visual analog scale (VAS) ranging from 0 (no pain) to 10 (worst pain imaginable). The subjective pain was quantified as follows: VAS 0 = 0, no pain; VAS 1-3 = 1, mild pain; VAS 4-7 = 2, moderate pain; VAS 8-10 = 3, severe pain. On each clinic visit, patients completed a questionnaire regarding shoulder-arm pain and mobility. Patients were asked to compare preoperative and postoperative conditions with regard to shoulder-arm pain, numbness, mobility, and lymphedema (Supplementary Fig. 1). Following our institution's protocol, in case of preoperative shoulder-arm pain and impairment of mobility, during clinical examination, standard radiography and magnetic resonance imaging of the shoulder were performed for medical legal reasons. Furthermore, for patients who had shoulder-arm pain (score 2-3) and/or impairment of mobility (score 1-3) in two or more planes of active and/or passive movements lasting more than 1 y after surgery, frozen shoulder diagnosis was made. In accordance with previous studies, diagnosis of frozen shoulder was based upon (1) a pattern of progressively restricted joint movement attributed to capsular restriction, (2) exclusion of other pathologies, and (3) normal glenohumeral imaging.[17] To this end, before orthopedic consultation, we also performed routine shoulder radiography to rule out other etiologies and magnetic resonance imaging to assess the thickness of the coracohumeral ligament and glenohumeral joint capsule.[18]

For this analysis, patients were excluded if they had undergone more than one previous surgical procedure related to the present pathology or if they were known to have locoregional or systemic progressive disease. No patient underwent axillary radiotherapy. Axillary dissection was always performed at the same time of mastectomy or lumpectomy. No patient underwent sentinel lymph node biopsy before axillary lymph node dissection (ALND). Patients were retrospectively divided into two groups: group A included patients who underwent surgery with traditional instruments (TIs) (traditional scalpel, scissors, ligations, and electrocautery), whereas patients operated on with HS comprised group B. In both groups, there were no women undergoing breast reconstruction. All procedures were performed by the same surgeon, in accordance with standardized surgical technique and were always concluded with placement of suction drain in the axilla. The median axilla drainage volume of patients operated on with the HS was 50 mL/d after 2 d, whereas it was 180 mL/d in the TI group on the third d after surgery. When drainage was less

Table 1 – Characteristics of patients undergoing breast surgery and axillary dissection with traditional instruments or harmonic scalpel—Wilcoxon rank sum test with continuity correction *P*-values.

	Traditional instruments group A	Harmonic scalpel group B	P-values
Number of patients	87	84	
Age*	52 (39-79)	56 (42-81)	0.72
Tumor size* (mm)	15 (0.9-32)	21 (0.7-38)	0.94
Number of nodes removed*	16 (8-32)	15 (9-30)	0.11
Nodes with metastasis*	2 (0-3)	2(0-5)	0.36
Number of patients N+ (%)	82 (94)	80 (95)	0.61
Number of patients N− (%)	5 (5.7)	4 (4.8)	0.41
BMI*	25 (20-27)	23 (19-25)	0.46
Conserving breast surgery (%)	60 (69)	54 (64)	0.21
Mastectomy (%)	27 (31)	30 (36)	0.74
Postoperative chemotherapy (%)	79 (91)	80 (95)	0.63
Postoperative hormonotherapy (%)	87 (100)	78 (93)	0.87
Presurgery shoulder pain (%)	2 (2.3)	1 (1.2)	0.93

BMI = body mass index.
* Median (range).

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