The American Journal of Surgery (2012) 204, 428–433

The American Journal of Surgery®

Clinical Science

The role of sentinel lymph node biopsy in select sarcoma patients: a meta-analysis

Sharee Wright, M.D., Kent Armeson, M.S., Elizabeth G. Hill, Ph.D., Christian Streck, M.D., Lee Leddy, M.D., David Cole, M.D., Nestor Esnaola, M.D., M.Ph., M.B.A., E. Ramsay Camp, M.D., M.S.C.R.*

Department of Surgery, Division of Surgical Oncology, Medical University of South Carolina and Ralph H. Johnson VA Medical Center, Charleston, SC, USA

KEYWORDS:
Sarcoma;
Sentinel;
Lymph node

Abstract

BACKGROUND: Sentinel lymph node (SLN) biopsy is a staging technique for occult lymph node disease. SLN biopsy has been applied to select patients with sarcoma, although the clinical utility remains uncertain.

METHODS: A PubMed/MEDLINE literature search was performed, and SLN biopsy outcomes were analyzed using a Bayesian meta-analytic approach to obtain point and interval estimates of rates of interest.

RESULTS: Sixteen studies involving SLN biopsy in patients with sarcoma were identified. Of 114 patients reported, 14 patients had positive SLNs (crude estimate, 12%; meta-analysis estimate, 17%). The meta-analysis false-negative rate was 29% (95% credible interval, 5%–59%). Recurrence and death rates in the SLN-positive group were higher than in the SLN-negative group.

CONCLUSIONS: This investigation highlights the current role of SLN biopsy in select patients with sarcoma for tumor staging. Questions regarding the high false-negative rate and management of micrometastatic lymphatic disease in patients with sarcoma still exist.

The technique of sentinel lymphatic mapping and node biopsy is a minimally invasive technique used to identify patients with occult microscopic lymph node disease. The procedure was first described by Cabanas[1] in 1977 for the management of penile cancer, although the 1992 landmark study in melanoma patients popularized the procedure and led to its widespread use as an effective regional nodal staging procedure.[2–5] This minimally invasive procedure allows the identification of sentinel lymph nodes (SLNs) within a regional lymph node basin receiving lymphatic drainage from the specific anatomic location of the primary tumor. Focused pathologic evaluation of SLNs to identify patients with occult microscopic lymph node disease allows appropriate regional nodal staging and helps direct further therapy, such as selective use of radical lymphadenectomy.

The benefit of SLN biopsy in melanoma and breast cancer management has prompted clinicians to apply the surgical technique to other malignancies, such as colon cancer and soft tissue sarcomas.[6–8] Although sarcomas typically metastasize hematogenously, specific sarcoma subtypes have an increased propensity to spread via the lymphatic system.[9–11] Sarcoma subtypes such as clear cell, epithelioid, rhabdomyosarcoma, synovial cell, and angio-

* Corresponding author. Tel.: 843-876-4420; fax: 843-876-3046.
E-mail address: campe@musc.edu
Manuscript received November 1, 2011; revised manuscript December 16, 2011

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http://dx.doi.org/10.1016/j.amjsurg.2011.12.019

Table 1 Studies of SLN biopsy in patients with sarcoma

Study	Year	Sarcoma type	Patients	SLN-positive patients	False negatives	Median follow-up (mo)
Neville et al[13]	2000	Rhabdomyosarcoma	3	1	0	*
		Other	1	0	0	
McMulkin et al[14]	2003	Rhabdomyosarcoma	1	0	0	32
Al-Refaie et al[15]	2004	Clear cell	3	1	1	12
Nishida et al[16]	2005	Clear cell	1	1	NA	12
Seal et al[17]	2005	Epithelioid	1	0	0	16
Albores-Zuniga et al[18]	2006	Clear cell	1	1	NA	*
Kayton et al[19]	2006	Other	2	0	0	16
van Akkooi et al[20]	2006	Clear cell	5	2	0	44
Fantini et al21	2007	Clear cell	1	0	1	13
Gow et al[22]	2008	Rhabdomyosarcoma	3	1	0	26
		Epithelioid	1	0	0	
		Synovial	5	0	0	
		Other	1	0	0	
Kayton et al[23]	2008	Rhabdomyosarcoma	9	1	3	53
		Epithelioid	4	0	0	
		Clear cell	2	0	0	
		Synovial	2	0	0	
		Other	9	0	0	
Swing and Geisinger[24]	2008	Rhabdomyosarcoma	1	1	NA	3
Tunn et al[25]	2008	Synovial	11	1	1	7–34†
De Corti et al[26]	2009	Rhabdomyosarcoma	5	1	0	35
		Epithelioid	1	0	0	
		Other	11	1	0	
Maduekwe et al[12]	2009	Epithelioid	10	0	1	29.5
		Clear cell	3	0	0	
		Synovial	16	1	0	
Picciotto et al[27]	2010	Clear cell	1	1	NA	*
Overall		Rhabdomyosarcoma	22	5	3	
		Epithelioid	17	0	1	
		Clear cell	17	6	2	
		Synovial	34	2	1	
		Other	24	1	0	
		Total	114	14	7	

*Follow-up data not available.
†Range (no median available).

sarcoma have documented high rates of regional lymph node involvement.[9–11] Currently, no standard protocols exist to evaluate lymph node basins in these particular sarcoma patients. However, in select patients, SLN biopsy at the time of primary resection may allow accurate nodal staging and assist in further therapeutic planning. Therefore, we performed a meta-analysis evaluating the available data in the literature regarding the role of SLN biopsy in soft tissue sarcomas.

Methods

Literature review

A literature search of PubMed/MEDLINE was conducted using the keywords "sentinel," "lymph node," and "sarcoma." The search revealed 16 studies in English meeting our inclusion criteria involving reports of patients with soft tissue sarcomas undergoing SLN biopsy. References from the identified articles were examined as well to confirm a complete literature review. With the small number of identified studies, we included single case reports as part of our review. Data collected from the identified studies included sarcoma type, the number of patients in the study, the number of patients with positive SLN biopsy results, sarcoma recurrence events, patients' survival status, and follow-up time when available (Table 1).[12–27]

Statistical analysis

A Bayesian random-effects meta-analytic approach to pool information across studies was used to obtain point and interval estimates of the rate of positive SLN biopsy results, the SLN biopsy false-negative rate, and the rate of nodal recurrence in the negative SLN biopsy patients. Specifically, the positive SLN biopsy rate is defined as the proportion of total patients biopsied with positive SLNs. We fur-