Primary excision is more cost-effective than magnetic resonance imaging (MRI) surveillance of lipomatous tumors of the extremity

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INTRODUCTION:

Lipomas and atypical lipomatous tumors (ALTs) comprise the majority of lipomatous lesions seen in the extremities. Despite similarities in presentation and radiographic appearance, lipomas and ALTs differ significantly in growth behavior, recurrence risk, and treatment recommendations. Whereas lipomas are typically observed or electively excised, ALTs are treated with marginal resection and post-resection surveillance. However, there is no consensus on whether MRI surveillance or excision is the optimal initial management for lesions of uncertain diagnosis. This study evaluates the cost-effectiveness of primary excision versus MRI surveillance for lipomatous extremity tumors suspected to be either lipomas or ALTs.

METHODS:

A Markov decision model with a two-year time horizon was created to compare the cost-effectiveness of surveillance versus primary excision. Transition probabilities were sourced from existing literature. Costs (USD) were assessed from a payer perspective using institutional billing data from a sarcoma center. Utilities were derived from a retrospective review of Toronto Extremity Salvage Scores (TESS) from 175 patients who underwent excision of lipomas or ALTs. The primary outcome was incremental cost-effectiveness ratio (ICER), calculated as cost per quality-adjusted life year (QALY), with a willingness-to-pay (WTP) threshold of $100,000/QALY. Both deterministic and probabilistic sensitivity analyses were conducted to address inherent uncertainty associated with cost-effectiveness modeling. The probabilistic sensitivity analysis consisted of Monte Carlo simulations across 10,000 samples.

RESULTS:

In the base case, surveillance yielded 1.32 QALYs at a cost of $14,325.05 per QALY, while primary excision yielded 1.43 QALYs at $12,430.14 per QALY. The ICER of choosing excision over surveillance was -$10,814.79. Probabilistic sensitivity analysis showed that excision was cost-effective 78% of the time at the $100,000/QALY threshold. Deterministic sensitivity analysis identified the key drivers of cost-effectiveness as MRI costs, pathology following excision, and utilities post-excision.

DISCUSSION AND CONCLUSION:

Both MRI surveillance and primary excision are cost-effective strategies for managing lipomatous lesions of the extremities. In a majority of situations, primary excision cost less and provided more QALYs than MRI surveillance, suggesting excision is more cost-effective than surveillance.

Figure 1. Cost-effectiveness Plot

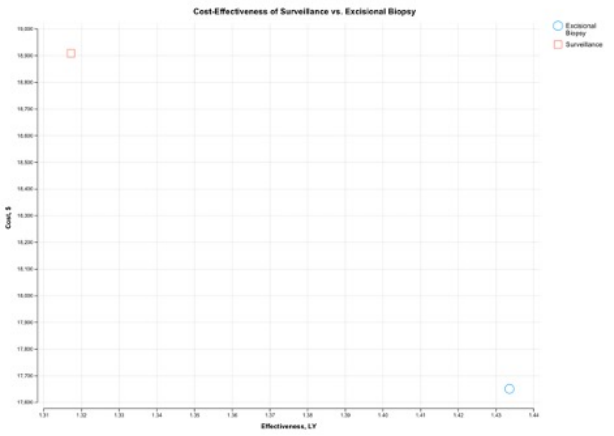

Table 1. Basic Model Assumptions

Category	Assumption
Time	
Follow up:	Modeled patient has follow-up every six months for two years. MRI scans completed no more frequently than every six months. Total number of MRIs dependent on MRI results.
Time Horizon:	Two-year time horizon
Time Cycle Length:	Six months
Number of time cycles:	Four total time cycles
Cycle corrections:	Half cycle corrections
Costs	
Perspective:	Payer (including administrative hospital costs)
Charge year:	2023 USD, Tertiary Sarcoma Center Billing data from April 2023 to July 2023
Surgical charges:	Surgeon fee, 75 minutes of operating room time (including operating equipment, tools, and associated nursing and support staff), charges associated with anesthesia services and materials required for general anesthesia, post-operative recovery time (including PACU and time in our institution's second stage facilities after PACU recovery)
Surveillance charges:	MRI scan fee, associated fees including routine lab work and support staff required to complete the MRI scans and associated contrast loads
Utilities	
Scores:	QALYs were scaled from retrospectively reviewed Toronto Extremity Salvage Scores (TESS) of our institution's patients from September 1, 2010 to Aug 31, 2021
Population:	Patients with deep (subfascial) lipomatous tumors of the extremity >5cm in size
Cost-effectiveness Evaluation	
Willingness to pay:	100,000 USD per QALY
Discount rate:	3% per annum for rewards and costs