

# Factors Influencing Ambulatory Function Following Internal Hemipelvectomy



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**Goal: performs a quantitative assessment of how musculoskeletal factors, including psoas muscle size and limb-length discrepancy, affect ambulatory function following internal hemipelvectomy without reconstruction**

## INTRODUCTION

### Background

Preservation of the psoas muscle in Type-II pelvic sarcoma patients undergoing internal hemipelvectomy without reconstruction may be associated with improved ambulatory functional outcomes. To understand better the influence of psoas muscle state on surgical outcomes, we studied the sensitivity of ambulatory function measures to several musculoskeletal anatomical changes related to the psoas muscle.

### Independent variables

- Ipsilesional and contralesional psoas muscle volume changes from pre-surgery to three months post-surgery (IPS-PV<sub>pre-3m</sub>, CON-PV<sub>pre-3m</sub>)
- Ipsilesional and contralesional psoas muscle volume changes from three months post-surgery to latest follow-up (IPS-PV<sub>3m-latest</sub>, CON-PV<sub>3m-latest</sub>)
- Limb length difference at three months post-surgery (LLD<sub>3m</sub>)
- Femoral migration from three months post-surgery to latest follow-up (FM<sub>3m-latest</sub>)
- Change in body weight from three months post-surgery to latest follow-up (BW<sub>3m-latest</sub>)
- Follow-up time (FT<sub>latest</sub>)

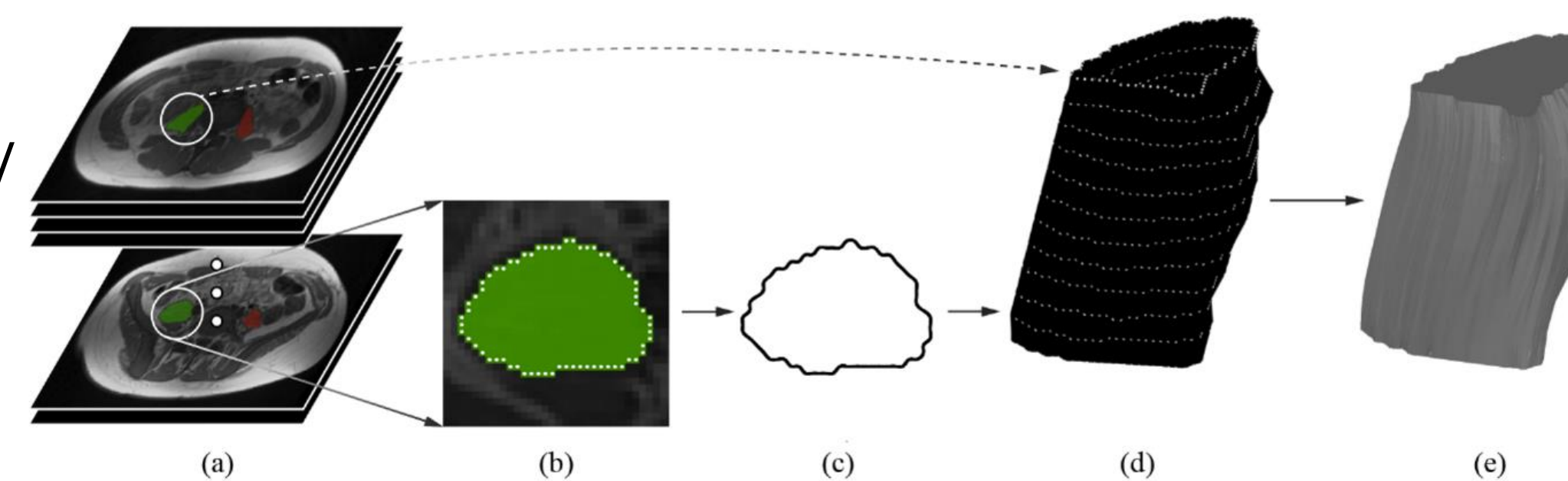
### Ambulatory Function

- Time Up and Go (TUG)
  - Gait speed test
- were available at two time points: three months post-surgery and latest follow-up. Improvement of each function measure was calculated between the time points.

## METHODS

### Muscle Reconstruction Process

12 eligible patients with imaging data available at three time points: pre-surgery (pre), three months post-surgery (3m), and latest follow-up (latest). Partial psoas volume was measured by creating a 3D surface model based on segmented T1-weighted MR images.



### Data Analysis

- One-sample t-test to determine if an independent variable was significant ( $\alpha=0.05$ ).
- Two-sample t-test to determine significant bilateral differences in anatomy ( $\alpha=0.05$ ).
- Simple linear regression to determine the strength of linear correlation, measured by coefficients of determination between independent variables and ambulatory function
- Stepwise linear regression, including all independent variables, to determine the importance of each independent variable.

## RESULTS

### One-sample and two-sample t-tests

- All independent variables were significantly different than zero.
- No significant difference in psoas muscle size changes were observed between ipsilesional and contralesional sides based on the two-sample t-tests.

### Single Linear Regression

	IPS-PV Change (%)		CON-PV Change (%)		Normalized LLD (%)		Normalized FM (%)	BW Change (%)	FT (mo)
	pre-3m	3m-latest	pre-3m	3m-latest	3m	latest	3m-latest	3m-latest	latest
TUG Change (%)	-0.222	0.348	-0.163	0.217	-0.708	-0.309	0.252	0.172	0.430
Gait Change (%)	-0.468	0.661	-0.334	0.346	-0.608	-0.541	-0.090	0.260	0.241

### Step-wise Linear Regression

Stepwise multivariable linear regression identified the three most important predictors of ambulatory function.

- TUG improvement was most sensitive to LLD<sub>3m</sub>, IPS-PV<sub>pre-3m</sub>, and FT<sub>latest</sub>.
- Gait speed improvement was most sensitive to IPS-PV<sub>3m-latest</sub>, IPS-PV<sub>pre-3m</sub>, and LLD<sub>3m</sub>.

Rank	TUG		Gait	
	Variable	r <sup>2</sup>	Variable	r <sup>2</sup>
1	LLD <sub>3m</sub>	0.501	IPS-PV <sub>3m-latest</sub>	0.437
2	IPS-PV <sub>pre-3m</sub>	0.564	IPS-PV <sub>pre-3m</sub>	0.634
3	FT <sub>latest</sub>	0.588	LLD <sub>3m</sub>	0.768
4	CON-PV <sub>3m-latest</sub>	0.599	FM <sub>3m-latest</sub>	0.798
5	FM <sub>3m-latest</sub>	0.605	FT <sub>latest</sub>	0.819
6	BW <sub>3m-latest</sub>	0.607	CON-PV <sub>3m-latest</sub>	0.830
7	CON-PV <sub>pre-3m</sub>	0.607	CON-PV <sub>pre-3m</sub>	0.836
8	IPS-PV <sub>3m-latest</sub>	0.608	BW <sub>3m-latest</sub>	0.838

## SIGNIFICANCE

### Quick Summary

Greater limb length difference initially after surgery was associated with lower rates of improvement, while increases in psoas volume over time were associated with higher rates of improvement. The ambulatory function generally improved over time.

### Clinical Implications

- Implementation of prehabilitation interventions during preoperative period such as muscle strengthening exercises could potentially be beneficial to minimize muscle loss in response to inactivity.
- Modifications to surgical technique that limits leg length discrepancy and psoas muscle loss immediately following surgery may be related to better functional improvements over time.

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