

Clinical Outcome Differences in the Treatment of Impending Versus Acute Pathological Long Bone Fractures



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Introduction

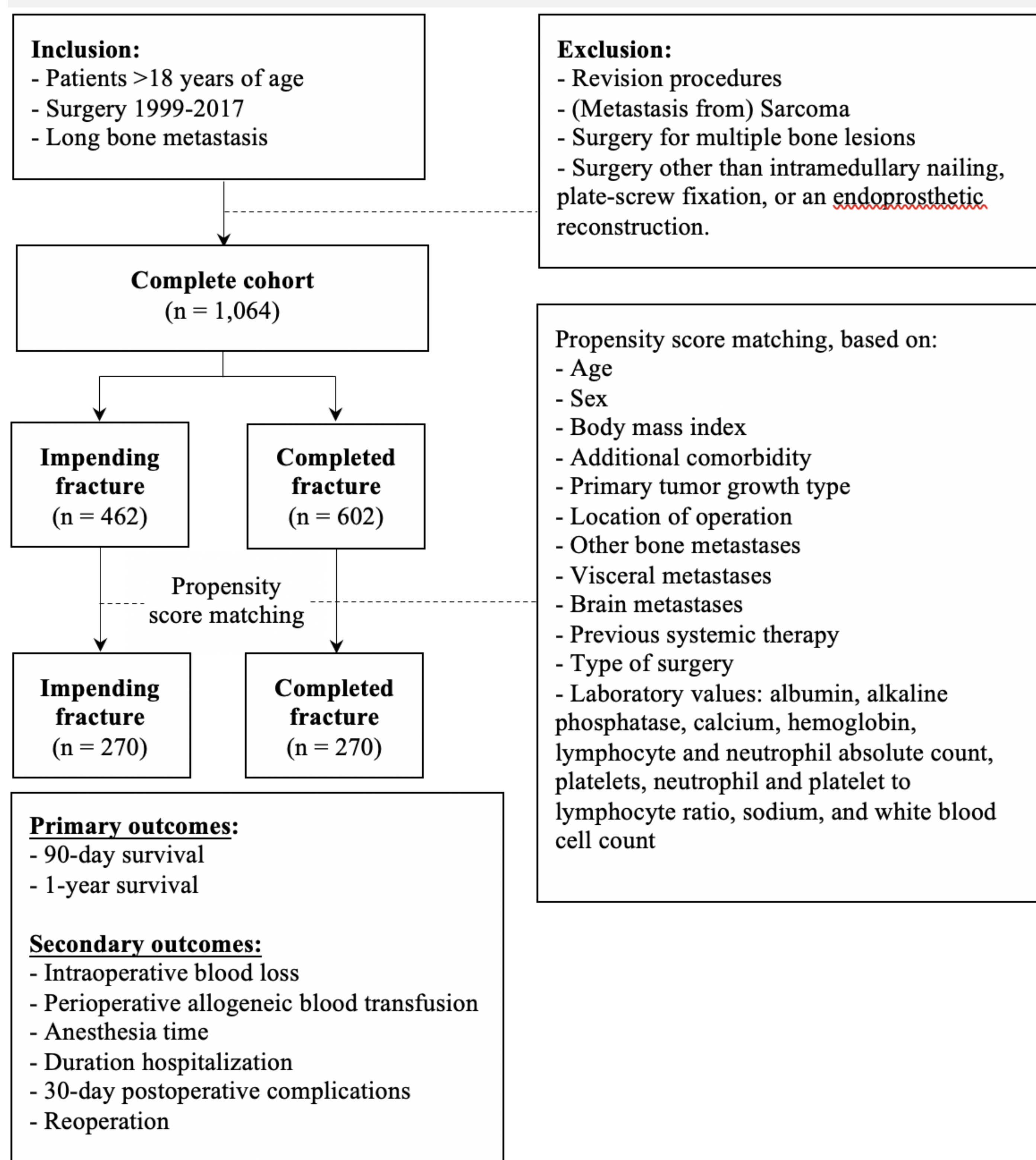
Skeletal metastases compromise the structural integrity of involved bone, leading to an increased pathological fracture risk. Pathologic fractures can result in significant morbidity and loss of quality of life. Prior studies suggest that prophylactic fixation of an impending pathological fracture might minimize postoperative pain, leads to less complications, faster rehabilitation, and better survival.

Study purpose

To assess differences in outcome between surgical treatment of impending versus pathological fractures in long bone metastases for

- (1) 90-day and 1-year survival
- (2) intraoperative blood loss, perioperative blood transfusion, anesthesia time, duration of hospitalization, 30-day postoperative complications, and reoperations.

Flowchart



Methods

We retrospectively performed a propensity score matched cohort study of 1,064 patients including 462 impending pathological fractures and 602 complete pathological metastatic long bone fractures.

After matching based on 22 explanatory variables, including primary tumor type, visceral metastases and type of surgical treatment, 270 impending pathological fracture cases were matched to 270 actual pathological fracture cases.

The primary outcome, 90-day and 1-year survival, was assessed by the cox proportional hazard model weighted by the inverse probability of treatment. The secondary outcomes were assessed by the McNemar test for categorical and Wilcoxon signed rank test for continuous outcomes.

Results

The 90 -day survival did not differ between groups (HR 1.13, 95%CI 0.81-1.56, P=0.48), while 1-year survival was higher for impending pathological fractures (HR 1.28, 95%CI 1.02-1.61, P=0.03).

Regarding secondary outcomes, impending fracture cases had lower intraoperative estimated blood loss (P=0.03); lower rate of perioperative blood transfusions (P=0.01); shorter anesthesia time (P=0.04); and underwent fewer reoperations (OR 2.50, 95%CI 1.92-7.86, P=0.049), while we found no differences for 30-days postoperative complications or hospitalization duration.

Comparison of primary and secondary outcomes in patients with impending and pathological fractures after (n=540) propensity score matching.

	After propensity score matching (n=540)		HR (95% CI) ^b	Standard error	P-value
	Impending (n=270) n (%)	Completed (n=270)			
Survival					
90-days	197 (73)	193 (71)	1.13 (0.81-1.56)	0.188	0.48
1-year	123 (46)	102 (38)	1.28 (1.02-1.61)	0.148	0.03
	Median (IQR)/n (%)		OR (95% CI)		
Intraoperative blood loss (liters)	0.2 (0.1-0.4)	0.3 (0.2-0.4)	-	-	0.03
Perioperative allogeneic blood transfusion	0 (0-2)	1 (0-2)	-	-	0.01
Anesthesia time (hours)	2.8 (2.1-3.5)	3.1 (2.5-3.6)	-	-	0.04
Duration hospitalization (days)	4 (3-7)	4 (3-7)	-	-	0.09
Systemic postoperative complications within 30 days	38 (14)	42 (16)	1.12 (0.69-1.83)	-	0.64
Reoperations	9 (3.3)	18 (6.7)	2.50 (1.92-7.86)	-	0.05

Conclusion

Patients undergoing surgery for an impending pathological fracture had a lower 1-year mortality rate and better secondary outcomes as compared to patients undergoing surgery for a completed pathological fracture, while accounting 22 potential confounders through propensity score matching.

Patients with an impending pathological fracture are suggested to benefit from prophylactic stabilization as stabilizing a complete pathological fracture seems to be associated with decreased survival, and increased blood loss, rate of blood transfusions, duration of surgery, and reoperation risk.

Implications for practice

The correct and timely identification of metastatic bone lesions that is at risk for developing a pathological fracture, and significant morbidity to patients, is essential for physicians providing oncological care including radiation oncologists, orthopaedic oncologists, and medical oncologists.

In order to benefit clinical oncologic practice, future research should aim to develop an accessible, easy to use and accurate prediction tool which identifies if a patient is at risk to develop a pathological fracture. With this future tool, patients who may benefit from prophylactic surgical stabilization can be identified.