Impact of Radiation Therapy on Survival of Patients with Soft Tissue Sarcomas of the Extremities and Trunk: A Cancer Registry Study

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Background

- High-grade soft tissue sarcomas (STS) are rare, malignant tumors of mesenchymal origin. Treatment of localized disease requires a multidisciplinary approach.
- The impact of radiation therapy (RT) on overall survival (OS) is controversial, with some studies showing a benefit, while others report no effect.
- Here, we analyzed the impact of RT on OS using real-world data from the Baden-Württemberg Cancer Registry (BWCR), Germany.

Methods

- Patients diagnosed with localized high-grade STS of the extremities and trunk between 2009 and 2023, as recorded in the BWCR, were analyzed.
- Histological subtypes included liposarcoma, leiomyosarcoma, sarcoma NOS, undifferentiated pleomorphic sarcoma (UPS), and fibrosarcoma.
- The patients were grouped into three treatment categories:
  - surgery alone,
  - surgery with neoadjuvant RT,
  - surgery with adjuvant RT.
- OS was assessed using Kaplan-Meier and Cox models, adjusted for age, sex, histological subtype, T-stage and grade.

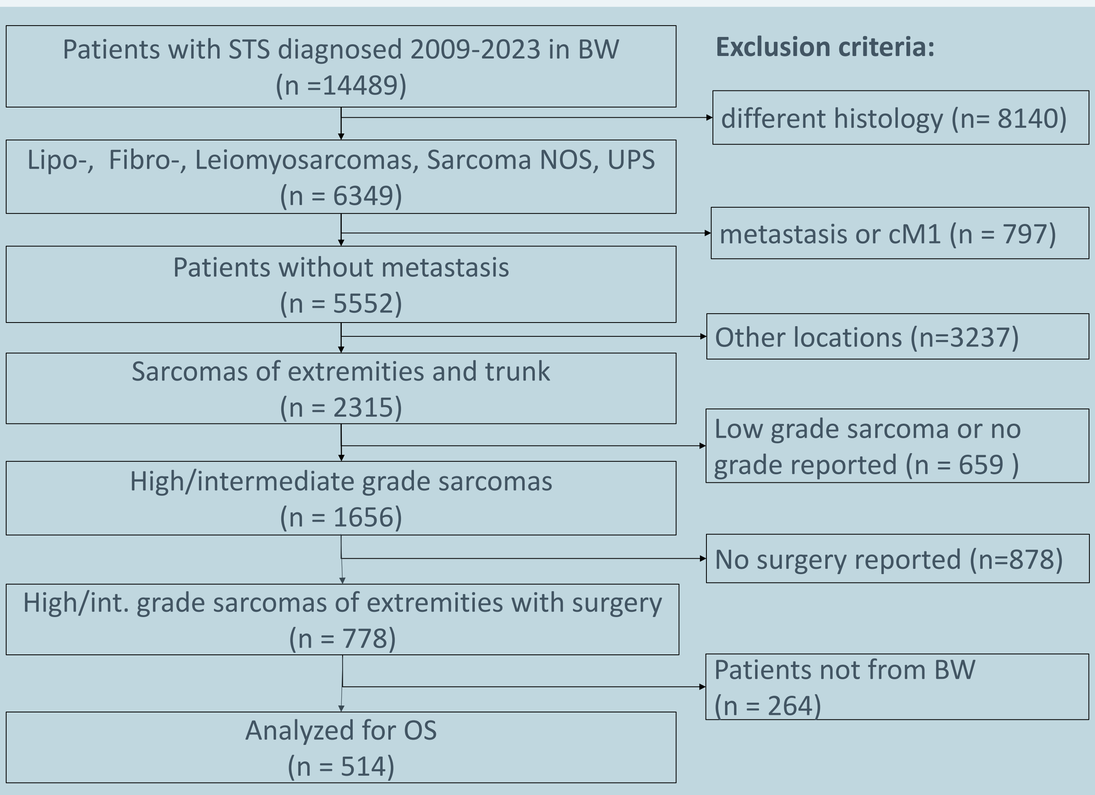


Fig. 1: Flow Chart

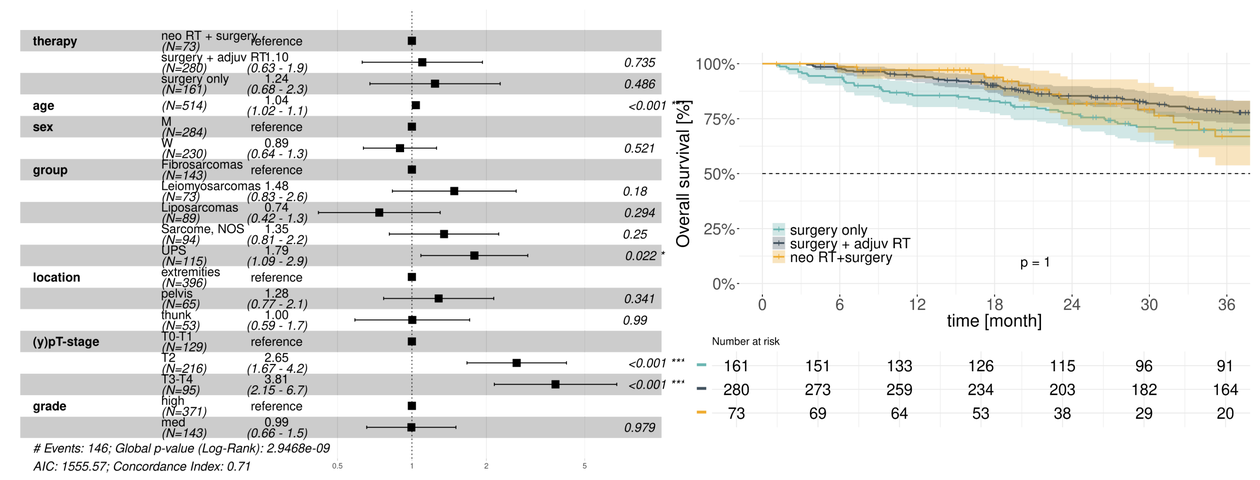
	Overall	surgery only	surgery + adjuv RT	neoadj RT + surgery	P - value
Total – no. (%)	514	161 (31.3)	280 (54.5)	73 (14.2)	
Age – mean (SD)	67.31 (14.8)	68.82(16.0)	66.82 (14.4)	65.88 (13.8)	0.267
Sex – no. (%)					0.301
▪ M	284 (55.3)	84 (52.2)	154 (55.0)	46 (63.0)	
▪ W	230 (44.7)	77 (47.8)	126 (45.0)	27 (37.0)	
(y)pT-stage – no. (%)					0.001
▪ T0-T1	129 (29.3)	44 (36.4)	70 (28.1)	15 (21.4)	
▪ T2	216 (49.1)	51 (42.1)	137 (55.0)	28 (40.0)	
▪ T3-T4	95 (21.6)	26 (21.5)	42 (16.9)	27 (38.6)	
Group – no. (%)					0.003
• Fibrosarcomas	143 (27.8)	46 (28.6)	84 (30.0)	13 (17.8)	
• Leiomyosarcomas	73 (14.2)	20 (12.4)	44 (15.7)	9 (12.3)	
• Liposarcomas	89 (17.3)	35 (21.7)	41 (14.6)	13 (17.8)	
• Sarcomas, NOS	94 (18.3)	30 (18.6)	56 (20.0)	8 (11.0)	
• UPS	115 (22.4)	30 (18.6)	55 (19.6)	30 (41.1)	
Grading – no. (%)					0.438
• high	371 (72.2)	111 (68.9)	204 (72.9)	56 (76.7)	
• med	143 (27.8)	50 (31.1)	76 (27.1)	17 (23.3)	
Location – no. (%)					0.272
• Pelvis	65 (12.6)	26 (16.1)	31 (11.1)	8 (11.0)	
• Extremities	396 (77.0)	119 (73.9)	216 (77.1)	61 (83.6)	
• Trunk	53 (10.3)	16 (9.9)	33 (11.8)	4 (5.5)	
RT-Dosis – mean (SD)	52.53 (11.31)		56.35 (11.33)	46.44 (8.25)	<0.001

Tab 1: Baseline clinical and patient characteristics

Results

- A total of 514 patients with a median follow-up of 39.3 months were identified.

Fig. 2: Multivariate Cox regression analysis and Kaplan Meier plots for overall survival



- There was no statistically significant difference in OS between groups, indicating that RT had no impact on survival in our real-world data cohort
- A Cox regression analysis shows that the grading as well as the timing of RT (perioperative or postoperative) has no impact on survival.
- Prognostic factors associated with a poorer survival were age (HR 1.04, 95%CI: 1.02-1.1), UPS subtype age (HR 1.79, 95%CI: 1.09-2.9) and larger tumor size (HR 2.65 for T2-stage and HR 3.8 for T3-T4 tumors)

Fig. 3: Subgroup Analysis: (y)pT-stage > pT1

- Patients who did not receive any RT tended to have smaller tumors.
- There was no significant difference between patients receiving RT and those with tumor resections only.
- The multivariable Cox model identified again age (HR 1.03, 95%CI: 1.02-1.04) and UPS histology (HR 1.84, 95%CI: 1.07-3.2) as prognostic factors in this cohort.

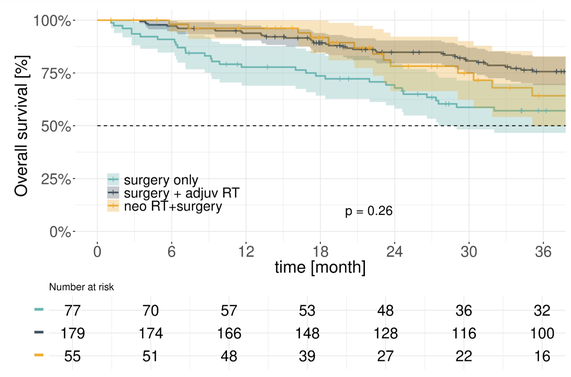
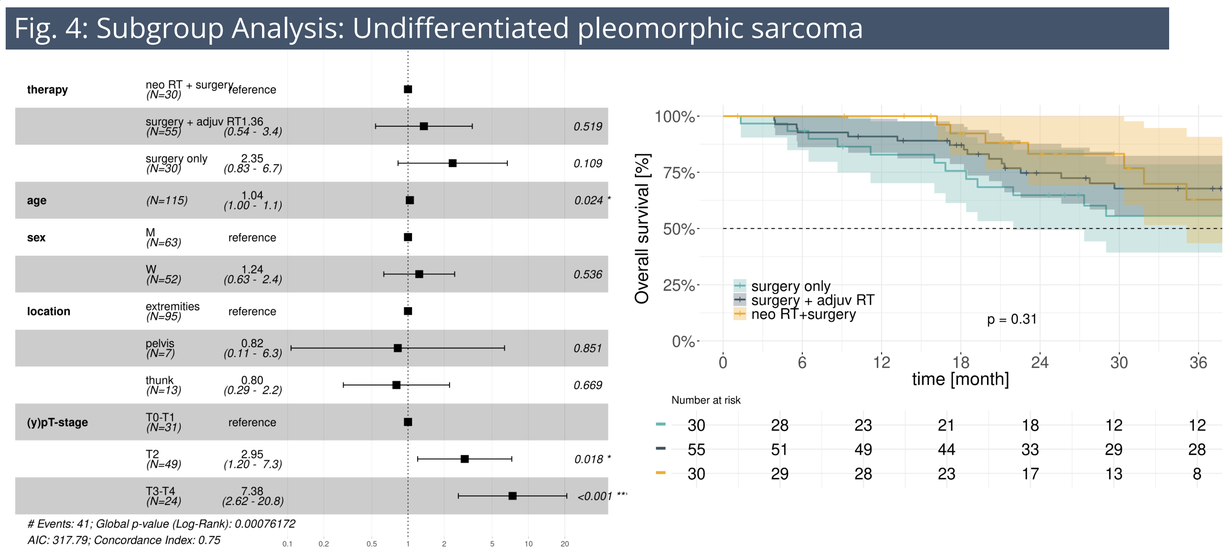


Fig. 4: Subgroup Analysis: Undifferentiated pleomorphic sarcoma



- A total of 115 patients with UPS subtype were analyzed, representing 22% of the entire cohort.
- These patients had significantly more aggressive tumors, with 90.4% having grade 3 (Table 1).
- However, the univariate Kaplan-Meier analysis again showed no statistical difference between the three treatment groups.
- The only significant prognostic factor for this subgroup, according to the multivariate Cox model, was tumor size, with a hazard ratio (HR) of 2.95 (CI 1.2-7.3) for T2 tumors and HR 7.38 (CI 2.6-20.8) for T3-T4 tumors compared to small T1 tumors

Conclusion

- This study adds significant new real-world evidence on the role of RT in STS.
- Our comprehensive analysis shows that patients treated with multimodality therapy including RT and surgery have no worse OS despite having more advanced T-stage and UPS histologic subtype which are historically associated with worse OS.

Conflict of interest

- Andreas Rimner: Institutional research grants: AstraZeneca, Merck, Varian Medical Systems, Boehringer Ingelheim, Pfizer; Consulting or Advisory Role: AstraZeneca, Merck, Boehringer Ingelheim, MoreHealth; Travel: AstraZeneca

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