The Scandinavian Sarcoma Group Register 1986–2001

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In 1986, the Scandinavian Sarcoma Group initiated a Register of sarcoma patients who had been referred to tumor centers in Finland, Norway and Sweden. The Southern Sweden Sarcoma Register served as a model for the SSG Register (Rydholm 1983). All sarcoma centers in Norway (Bergen, Oslo, and Trondheim) and Sweden (Gothenburg, Linköping, Lund, Stockholm, Umeå) have continuously reported patients to the SSG Register. In these countries patients with sarcoma of the trunk wall and extremities are not treated outside of these referral centers except by mistake. Comparisons with the respective National Cancer Registries shows that approximately 90% of bone and soft tissue sarcoma patients are treated at a center. Therefore the SSG Register is population based for these two countries (Bauer et al. 2001).

In Finland, Helsinki University Hospital participated in the Register up until 1993 but has not reported patients thereafter. Instead Turku University Hospital has reported all their patients since 1994. The SSG Register is therefore not population based for Finland and we do not know to what extent sarcoma patients are referred to centers.

4074 patients with bone sarcoma (BS) or soft tissue sarcoma (STS) of the trunk or extremities have been reported between March 1986 and December 2001 (Table 1). There are also retroperitoneal and visceral sarcomas reported to the SSG Register but these have so far not been analyzed.

The SSG Register has been the basis for two theses: on synovial sarcoma (Skytting 2000) and on local recurrence of soft tissue sarcoma (Trovik 2001). There are several ongoing research projects based on the SSG Register regarding MFH (J. Engellau), leiomyosarcoma (C. Svarvar), liposarcoma (K. Engström), giant cell tumors (G Follerås) and chondrosarcoma of the thoracic wall (B. Widhe).

Most BS patients were included in SSG and ISG/SSG trials and are reported elsewhere in this Supplement. The SSG Register has also contributed patients to EMSOS studies of MFH in bone (Bielack et al. 1999) and of osteosarcoma over the age of 40 (Grimer et al. 2003).

Soft tissue sarcoma of trunk or extremities

Approximately 200 STS patients are referred

Table 1. Participating centers and number of patients reported 1986–2001 with bone sarcoma (BS) or soft tissue sarcoma (STS) of trunk or extremities

Center	BS	STS	Total
Finland			
Turku	*24*	*92*	*116*
Norway			
Oslo	*346*	*675*	*1021*
Bergen	*108*	*194*	*302*
Trondheim	*39*	*99*	*138*
Sweden			
Stockholm	*326*	*711*	*1037*
Gothenburg	*218*	*423*	*641*
Lund	*144*	*372*	*516*
Umeå	*55*	*131*	*186*
Linköping	*29*	*87*	*126*
Total	*1289*	*2785*	*4074*

Table 2. Tumor and treatment features for patients treated for primary subcutaneous STS. n = 751. Values are %.

	1986–1989 n=141	1990–1989 n=441	1999–2001 n=169
Size ≥ 5 cm	51	46	49
High grade	75	79	78
Amputation	6	2	2
Wide margin	77	76	72
Radiotherapy	11	17	26
Chemotherapy	2	3	5

Table 3. Tumor and treatment features for patients treated for primary deep STS. n = 1405. Values are %.

	1986–1989 n=283	1990–1989 n=846	1999–2001 n=276
Size ≥ 10 cm	48	45	50
High grade	80	75	78
Amputation	16	10	7
Wide margin	60	57	51
Radiotherapy	23	33	40
Chemotherapy	5	8	22

yearly to sarcoma centers in Norway and Sweden. The principle of referring patients with suspect STS before open biopsy or surgery is followed in Scandinavia. Overall 61% of the patients were referred before any surgical procedure. For deep lesions this principle is most important. The rate of primary referral before surgery has improved from 69% 1986–1989 to 84% 1999–2001 ($p<0.001$). Hence the referral practice for deep STS in Scandinavia is equally good as for BS (87%).

A wide margin was in the SSG I study shown to be associated with a low risk of local recurrence (Alho et al. 1989). Hence, in Scandinavia adjuvant radiotherapy was only considered after an intralesional or marginal margin. Trovik (2001) showed that the overall local control rate for patients treated primarily at a sarcoma center was 83%. For patients with high-grade, deep lesions the rate was 77%. In Trovik's study, based on a much larger and unselected patient series, the local control rate was only 75% after a wide margin. Even more surprisingly a myectomy was not proven to provide better results than other wide margins.

The amputation rate for STS was 13% 1986–1989 but only 5% 1999–2001 (Table 2 and 3). The surgical margins have not improved, there were 66% wide margins 1986–1989 and 59% 1999–2001.

Based on Trovik's results the indications for radiotherapy in soft tissue sarcoma have changed to include patients with high-grade soft tissue sarcoma operated with a wide margin. This is still not generally adopted in Scandinavia but the use of radiotherapy is increasing. 1986–1989, 26% of patients with high-grade, deep-seated, STS received radiotherapy, as compared to 40% 1999–2001 ($p<0.001$) (Table 3). Still, approximately 20% have poor surgical margins and do not receive radiotherapy.

Most centers prefer postoperative radiotherapy but at the Karolinska Hospital preoperative treatment is instead given in cases where an indication for radiotherapy is expected. During 2001–2002, 59% of the patients received radiotherapy and two-thirds of these had preoperative treatment (O'Sullivan et al. 2002).

It is still too early to assess to what extent improved referral and wider indications for adjuvant radiotherapy will improve the rate of local control. The follow-up of patients treated during the last years is still insufficient. However, preliminary results from the Karolinska Hospital, where all patients have been follow until 2003, are encouraging. The 5-year local control rate 1986–1989 was 67% as compared to 90% 1997–2002. The improved results were probably due to better surgical margins as well as increased use of adjuvant radiotherapy.

The causal relationship between a local recurrence of soft tissue sarcoma and subsequent metastases remains a highly controversial issue (Gustafson et al. 1991, Trovik and Bauer 1994, Lewis et al. 1997). There is common agreement that local recurrence and metastases are associated in the sense that the local recurrence is a marker of malignant behavior. This appears independent from other prognostic factors such as high grade, necrosis, and large tumor size (Clement et al. 2000). Improved local control has in several studies not lead to improved overall survival (Tanabe et al. 1994, Li et al. 1996).

At the Karolinska Hospital, not only improved local control since the late 1980s has been achieved but also improved survival rates. The

Table 4. Comparison of size (median), depth and grade of STS from patients at the Karolinska Hospital and other SSG Centers

	Karolinska Hospital			Other SSG Centers		
	1986–1989	1990–1998	1999–2001	1986–1989	1990–1998	1999–2001
Size, cm	9	6	6	7	7	8
Deep, %	80	63	60	64	67	63
High grade, %	70	79	75	78	75	78

metastasis-free survival of soft tissue sarcoma patients treated 1986-1989 was 57% as compared to 75% 1997–2002. The improvement is dramatic and is largely due to improved referral, there are now more patients with small and subcutaneous lesions (Table 4). The question remains whether this is enough to explain the dramatic improvement. Adjuvant chemotherapy was used in less than 20 % of the patients and will not have contributed significantly to the improved survival rate.

In the whole SSG Register, tumor size and proportion with deep lesions has not changed as dramatically as at the Karolinska Hospital; probably because good referral practices were already established in other parts of Sweden and in Norway in the late 1980s (Table 4). The changes in referral patterns seen and the improvement in local control and survival at the Karolinska Hospital warrants further investigation. We plan to run the SSG Register against the Swedish and Norwegian Cancer Registries so we can account for all soft tissue sarcomas during the time-period. Survival analysis on such a large and complete population based material will tell us to what extent the efforts to improve primary care of sarcoma patients translates into less morbidity and better survival.

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