Incomplete margins are a risk factor for local recurrence and shorter disease-free interval. Because of this, after resection of a STS, if incomplete margins are achieved, further therapy is indicated. Further therapy can be re-excursion of the previous surgical scar, radiation therapy, or metronomic chemotherapy.

If wider (and deeper) surgical excision is possible after an incomplete excision, this can be done. The principle of the second surgery (re-excursion) is to include and remove all of the previous surgical bed and scar. The rational for having to do so is that at the time of the last surgery, because incomplete margins were achieved, then the surgical instruments must have touched tumor cells, which then allowed the possibility of seeding a tumor cell anywhere in the original surgical bed. A study (Bacon 2007) has looked at the outcome of the re-excursion: local recurrence occurred in 15% of the dogs. Interestingly, finding residual tumor cells in the tissues resected with the second surgery was not prognostic for local recurrence. Finding tumor cells in the tissues occurred in only 22% of the cases.

Surgery is the mainstay for treating soft tissue sarcomas (STS) in dogs. Radiation therapy and chemotherapy may play a role but the true benefit of these modalities remains ill defined. Radiation therapy and chemotherapy alone are not considered appropriate for a curative intent-
treatment. However, radiation therapy and chemotherapy may have a role in the adjuvant setting. As well, radiation therapy and chemotherapy alone can have a role in the palliative setting.

One of the indications for radiation therapy and chemotherapy is when incomplete margins are achieved with surgical excision. This can be after a failed attempt at getting a wide excision or it can be a planned incomplete excision. A planned incomplete excision is for when wide surgical excision is not possible or acceptable. A marginal excision is performed followed by adjuvant therapy. Marginal excision can be combined with radiation therapy or chemotherapy. As a general rule, radiation therapy is best against microscopic disease instead of measurable tumors.

Typically, radiation therapy is delivered on a daily basis, Monday through Friday, for 18 to 20 fractions. Total dose of radiation reported in the literature with this type of fractionation is up to 63 Gy. Other protocols such as four fractions, 8 to 9 Gy each, for a total of 32 to 36 Gy over 21 days have been reported. Rates of local recurrence following adjuvant radiation therapy have been reported to be up to 43%.

Chemotherapy to help prevent local recurrence is metronomic chemotherapy. This is daily, low-dose oral chemotherapy. The drug that is the most widely used in this setting is cyclophosphamide in combination with piroxicam. In one study (Elmslie 2008) evaluating metronomic chemotherapy in dogs with incompletely excised STS, the median disease-free interval for the control group was 211 days whereas the median was not reached for the group of dogs receiving metronomic chemotherapy. The estimated rate of local recurrence by the Kaplan Meier method was about 20% at about 1500 days. The proposed mechanisms of action
of metronomic chemotherapy are inhibition of angiogenesis and restoration of immune function.

Maximal tolerated dose (MTD) chemotherapy is typically given for the presence or high risk of metastasis. Overall metastatic risk for canine STS is about 20% but it is grade dependent. Grade is therefore prognostic for the risk of developing metastasis. The metastatic risk for a grade I tumor is about 5-10%, for a grade II tumor is about 20%, and for a grade III tumor is about 40-50%.

MTD chemotherapy is offered to dogs with grade III STS. Doxorubicin is often chosen. However, the current evidence to use doxorubicin in dogs with high grade STS does not show a survival advantage. One study looking at the benefit of doxorubicin in dogs with grade III STS (Selting 2005) found no survival advantage for dogs receiving doxorubicin. However, given the retrospective nature of the study, absolute proof still remains absent. The clinical approach in dogs to offer doxorubicin is based on human oncologic practice, in which chemotherapy for these tumors also remains controversial. Nevertheless, a meta-analysis of 18 human studies found that adjuvant doxorubicin, with or without ifosfamide, provided modest benefits in local tumor control, metastatic control, and overall survival amongst nearly 2,000 patients with localized resectable STS of all grades (Pervaiz 2008).

To treat measurable metastatic disease, MTD chemotherapy is typically disappointing with no response most of the time or a response of relatively short duration. Metronomic chemotherapy to treat metastatic disease remains to be studied.