Sarcoma Board Review 2020

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Disclosures

Honoraria/advisory: Daiichi Sankyo, Apexigen

Grants/research: Immune Design, Merck, EMD Serono, Incyte, Omeros, Presage, Janssen, Juno

Outline

1) Overview (etiology/risk factors/diagnosis)

Soft Tissue Sarcomas:

2) Non-GIST soft tissue sarcoma

    - Includes treatment of select “benign,” aggressive tumors

3) GIST

4) Bone Sarcomas

- Osteosarcoma
- Ewing sarcoma

Sarcoma (1% of all cancer - percentages include children and adults; 20,000 patients all combined)

Bone Sarcomas (10%):

- Osteosarcoma
- Ewings Sarcoma
- Chondrosarcoma
- Giant Cell Tumor
- Other

Soft Tissue Sarcoma (STS)

GIST (18%)

RMS (3%)

Other “special” STS:
Kaposi’s (3%)
DFSP (5%) etc.

Non-GIST
Non-RMS
Not special
STS:

Or, in other words, what I usually call: STS

Ducimetriere et al 2011

Risk Factors

- Lymphedema
  - Stewart-Treves (cutaneous angiosarcoma)
- Immunodeficiency
  - Human herpes virus 8 (Kaposi's Sarcoma)
- Chemical exposures?
- Role of Trauma?
- Radiation:
  - <1% of treated patients
  - Median latency 10 years following RT
  - Rarely seen with doses <40 Gy
  - Increased risk with anthracyclines + alkylating agents
  - Undifferentiated pleomorphic sarcoma (UPS) most common subtype
  - Angiosarcomas in breast cancer patients
- Genetics…

Genetic Predisposition For Sarcoma

- Neurofibromatosis (type 1) – Malignant Peripheral Nerve Sheath Tumors (MPNST) and others
- Retinoblastoma – Osteosarcoma, leiomyosarcoma and others
- Li-Fraumeni syndrome – Many Sarcoma types
- Gardener's syndrome (familial adenomatous polyposis) – Desmoid Tumors [1]

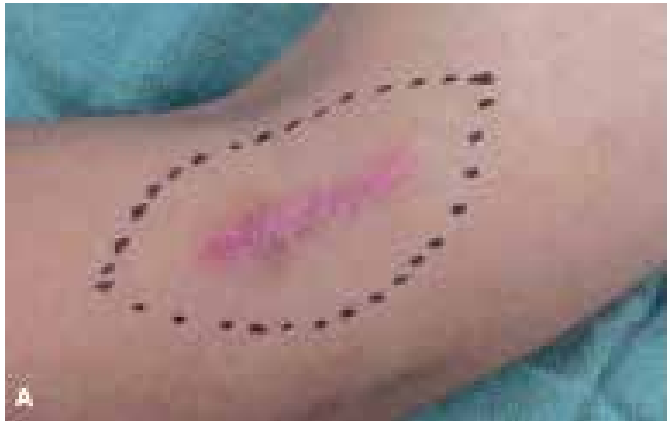
- Other Syndromes: Tuberous sclerosis (rhabdomyosarcoma) , Rothmond-Thomas Syndrome (Osteosarcoma) , Costello Syndrome (Rhabdomyosarcoma), Beckwith-Wiedmann Synodrome (Rhabdomyosarcoma), Multiple Enchondromas (Chondrosarcoma) [2]

[1]Thomas et al J. Surg Onc 2015
[2]Pakaksama et al., Ped Clin N. Amer. 2002

Biopsy

For Extremity Tumors:

- Usually core biopsy or incisional biopsy preferred.
  - Extremity masses should be biopsied through a small *longitudinal* incision so that entire biopsy tract can be excised at the time of resection
- Tru-cut core biopsies may be adequate.
- FNA has no role in initial diagnosis of extremity STS. May document a recurrence.
- Excisional biopsy for small <3 cm superficial tumors.



For abdominal tumors, biopsy is not helpful unless:

- Suspect lymphoma or germ-cell tumor
- Plan to give preoperative chemotherapy and/ or radiation
- Tumor is unresectable

Lewis J, Brennan MF. Current Probl Surg 33: 817: 1996
Mankin HJ et al. J Bone Joint Surg 78A:656-63: 1996

Histological Subtype: Expert Review is Key

- Presant and colleagues reviewed 216 sarcoma cases to see if experienced academic pathologist would agree with pathologists who see few sarcomas.
- Experienced pathologist have a high degree of concordance
- However, in experienced pathologists misclassify sarcomas 27% of time
- 6% of tumors initially called “sarcomas” were not actually sarcoma

Summary: any pathology thought to be sarcoma should be reviewed by an experienced bone and soft tissue pathologist.

Presant et al. JCO 1986

Histological Grade

- Histological grade predicts risk of metastasis and survival
- FNLCC (most common): based on differentiation, mitosis, necrosis. Slightly improvement in predictive power over histology based NCI system.
- Grade is of no prognostic value in certain subtypes:
  - MPNST
  - Extraskeletal myxoid chondrosarcoma
- Others are always considered high grade
  - Angiosarcoma
  - PNET

Guillon, JCO 1997
Coindre, Arch Pathol Lab Med. 2006

Translocation-related Sarcomas

Disease	Chromosomal Change	Fusion Gene	Frequency
Ewing's/PNET	t(11;22) or t(21;22)	*EWS-FLI1* *EWS-ERG*	85% 5-10%
Synovial sarcoma	t(x;18)	*SYT-SSX*	> 90%
Myxoid liposarcoma	t(12;16)	*CHOP-TLS*	> 75%
Alveolar rhabdomyosarcoma	t(2;13) or t(1;13)	*PAX3-FKHR* *PAX7-FKHR*	70% 15%
Clear cell sarcoma	t(12;22)	*EWS-ATF1*	> 75%
Desmoplastic small round cell tumor	t(11;22)	*EWS-WT1*	> 90%

Standard Imaging/Staging Approach

MRI:
• important for extremities (e.g. muscle versus tumor/fat), head and neck, chest wall
•Accurate at defining tumor relationship to muscle, fascial planes, bones and neurovascular bundles

CT:
•Initial chest CT recommended to evaluate for metastatic disease in all sarcoma patients
•Used as main evaluation for primary sarcomas in the abdomen and pelvis.

Other imaging including PET may play a role in select circumstances

Soft Tissue Sarcoma Staging

Stage IA	G1,2	T1a,b	N0	M0
Stage IB	G2	T2a,b	N0	M0
Stage IIA	G3,4	T1a,b	N0	M0
Stage IIB	G3,4	T2a	N0	M0
Stage III	G3,4	T2b	N0	M0
Stage IV	Any G	Any T	N1	M1

5 year Survival by AJCC Stage	
Stage I	**90%**
Stage II	**70%**
Stage III	**50%**
Stage IV	**10-20%**

Stojadinovic A, Leung DH et al. J Clin Oncol 20; 4344-52: 2002

Staging of Bone Sarcomas

		Enneking Stage	AJCC Stage
IA	Low grade	Intracompartmental	< 8 cm
IB	Low grade	Extracompartmental	> 8 cm
IIA	High grade	Intracompartmental	< 8 cm
IIB	High grade	Extracompartmental	> 8 cm
III	Any grade	N1 or M1	Skip metastasis
IVA	Any grade	Has no stage IV	Lung only mets
IVB	Any grade		Lymph node or other sites

Key “pearls” for Overview (etiology/risk factors/diagnosis)

- Translocations and heritable syndromes are easy to test. Memorize these.
- Transverse incisions and FNA are “no-no’s” for evaluation of soft tissue masses
- Review pathology with an experienced bone and soft tissue pathologist
- Grade and tumor size are both important predictors of local recurrence, distant metastasis and survival.

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Prognostic Factors in STS

- **Histologic grade – includes:** Differentiation (histology specific), mitotic rate, extent of necrosis
- **Tumor size (Stage includes size and grade)**
  Other tumor-related factors
- Depth (superficial/deep to fascia)
- Site (extremity vs trunk/retroperitoneum; distal vs proximal) **Treatment setting**
- Better outcomes at high-volume sarcoma centers: Improved R0 margin rate, local recurrence rate, 30-day mortality, overall survival and functional outcomes
- **Adherence to guidelines — associated with improved survival**

Adapted from *Research to Practice Soft Tissue Sarcoma Grand Rounds*
Abarca T et al. *J Surg Oncol* 2018;117:1479; Bagaria SP et al. *Sarcoma* 2018a, b; Gutierrez JC et al. *Ann Surg* 2007;245:952; Clasby R et al. *Br J Surg* 1997;84(12):1692; Gustafson. *Acta Orthop Scand* 1994;65(1):47; Voss RK et al. *Ann Surg Oncol* 2017;24(11):3271.

Treatment of Localized STS

- Surgery + RT (most common)
- Surgery + chemo + RT – may make sense for large high grade tumors where surgery is difficult
- Neoadjuvant Chemo – may play a role for larger, higher grade tumors
- Adjuvant Chemo – controversial and not definitively proven but likely plays a role for some patients

Extremity Soft Tissue Sarcoma Surgery

- Whenever possible, function- and limb- sparing procedures should be performed
- As long as the entire tumor is removed, less radical procedures do not adversely affect local recurrence or outcome
- Goal is complete removal of the tumor with negative (2-3 cm) margins and maximal preservation of function

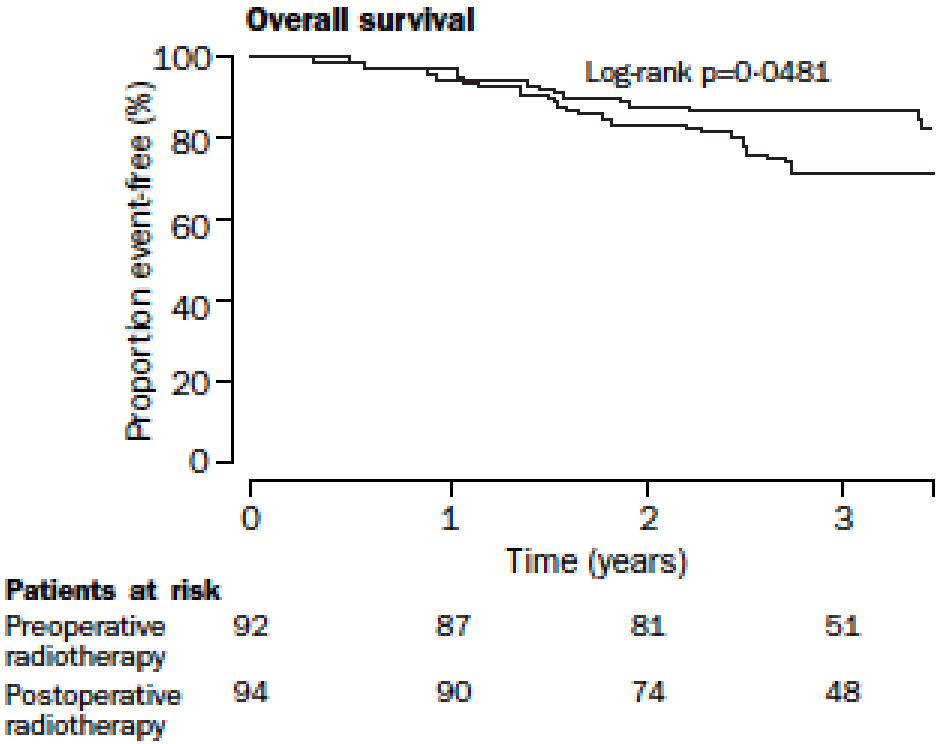
Rosenberg SA, Tepper J et al. Ann Surg 196; 305-15: 1982

Extremity Soft Tissue Sarcoma: Adjuvant Radiation

- Wide surgical excision alone is adequate for small lesions <5 cm
- Consider adjuvant RT with high grade lesions greater than 5 cm or with resection margin <1 cm
- RT choices include IORT and Brachytherapy

Yang J, Chang A, et al. J Clin Oncol 16;197-203: 1998

Adjuvant versus Neoadjuvant Radiation



Neoadjuvant Radiation:
Higher rates of wound complications
Higher rates of returning to the operating room.

Adjuvant Radiation:
Higher rates of edema and fibrosis
Higher rates of radiation associated fractures.

Although the O'sullivan series showed better survival with neoadjuvant rads compared with post-op rads, others have criticized it as it was not an intention-to–treat analysis

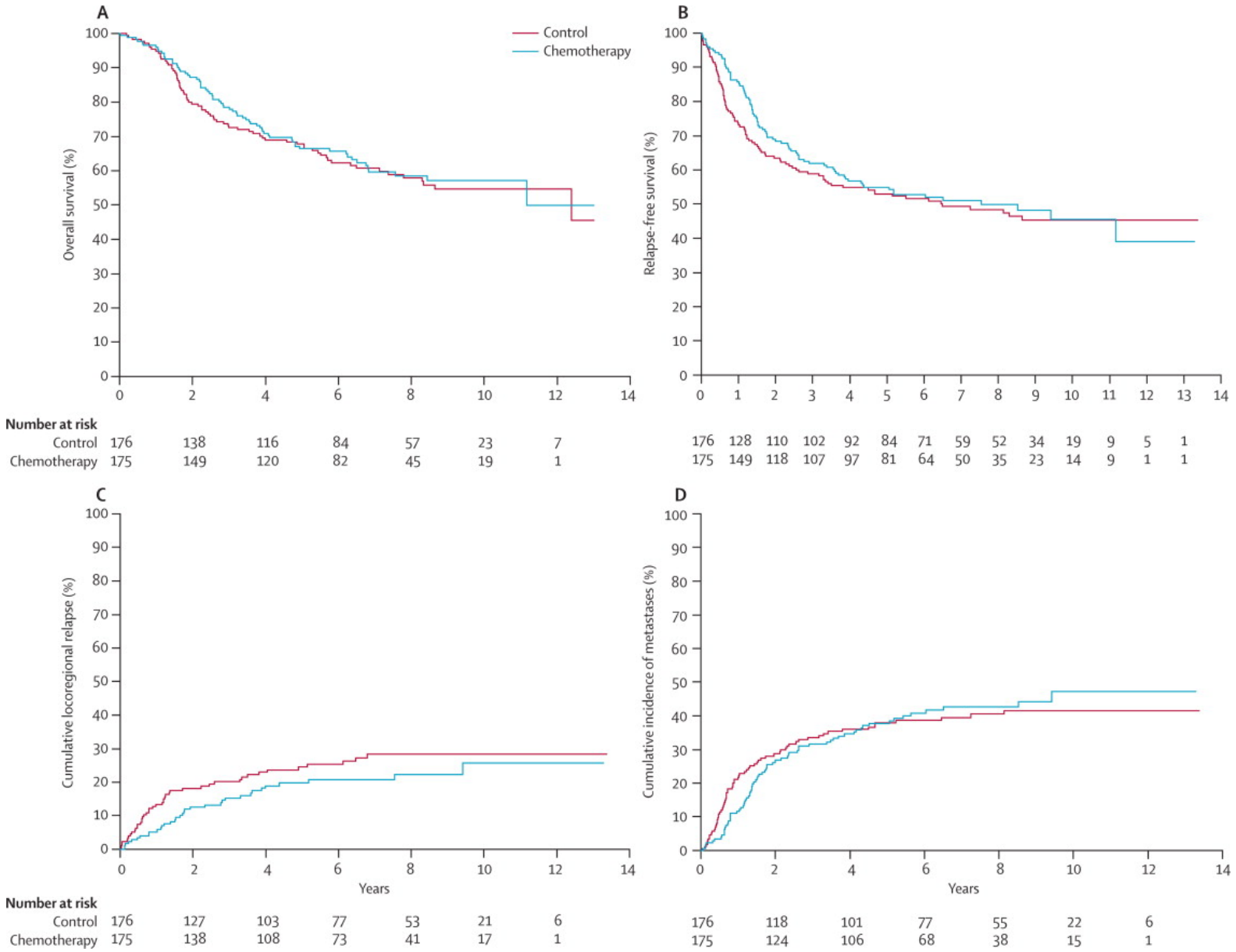
O´Sullivan et al, Lancet, 2002

Adjuvant Chemotherapy

- The role of chemotherapy is established in some special cases:
  - Ewing's/ PNET
  - "Pediatric type" rhabdomyosarcoma (Embryonal or Alveolar)
- Local therapy alone only cures 10-20%.
- Addition of combination chemotherapy affords cure rate of
  - 60-70% in Ewing's/ PNET
  - 60-90% in embryonal rhabdomyosarcoma

These are relatively rare tumor types in the adult population …

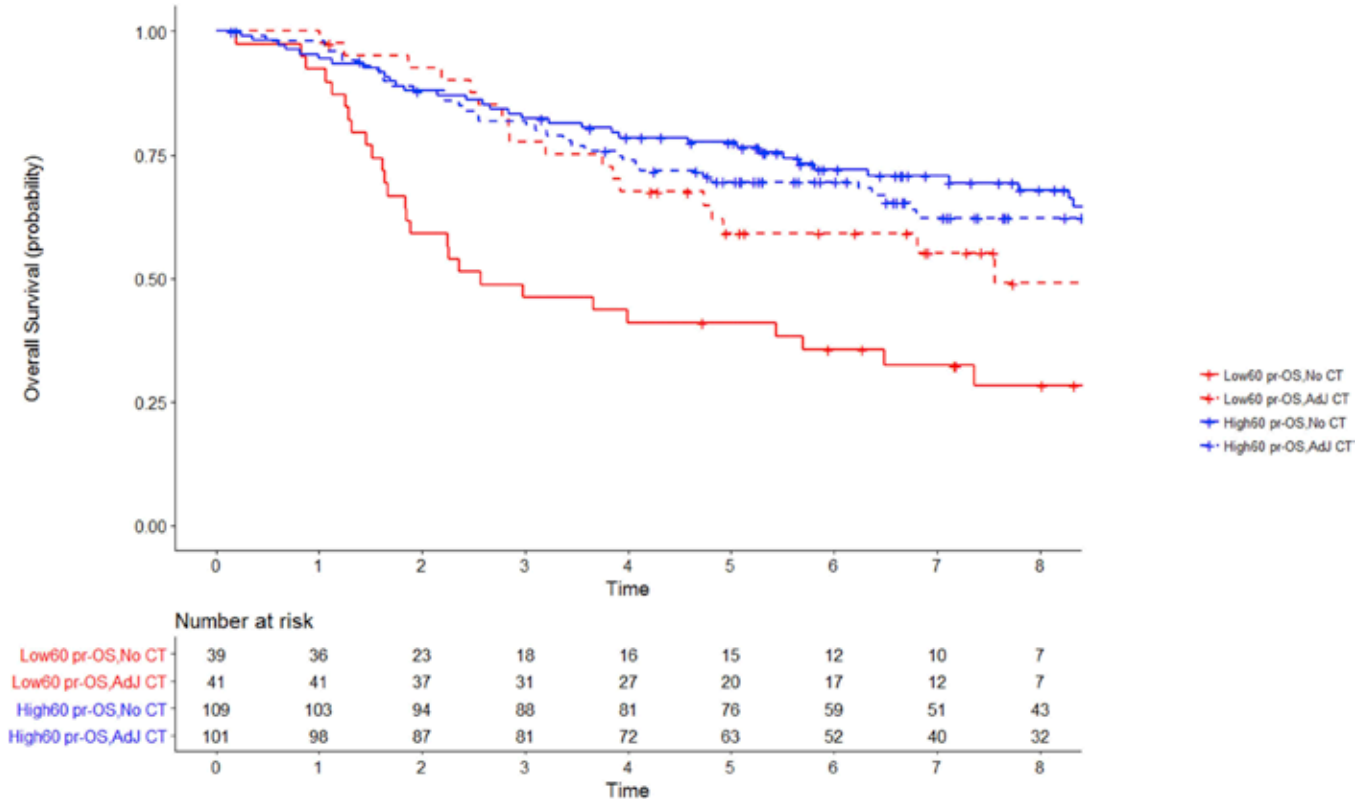
EORTC Adjuvant trial



Randomised trial ± doxorubicin 75mg/m^2 + ifosfamide 5g/m^2 + lenograstim q 3wk x 5 Woll P et al, Lancet 2012

Navigating Adjuvant Chemo:

- High-risk patients identified using the “sarculator” nomogram.
- For these patients, in the EORTC adjuvant trial, chemo improved survival
- Most sarcoma physicians in the US are giving adjuvant chemotherapy to their most high-risk patients.



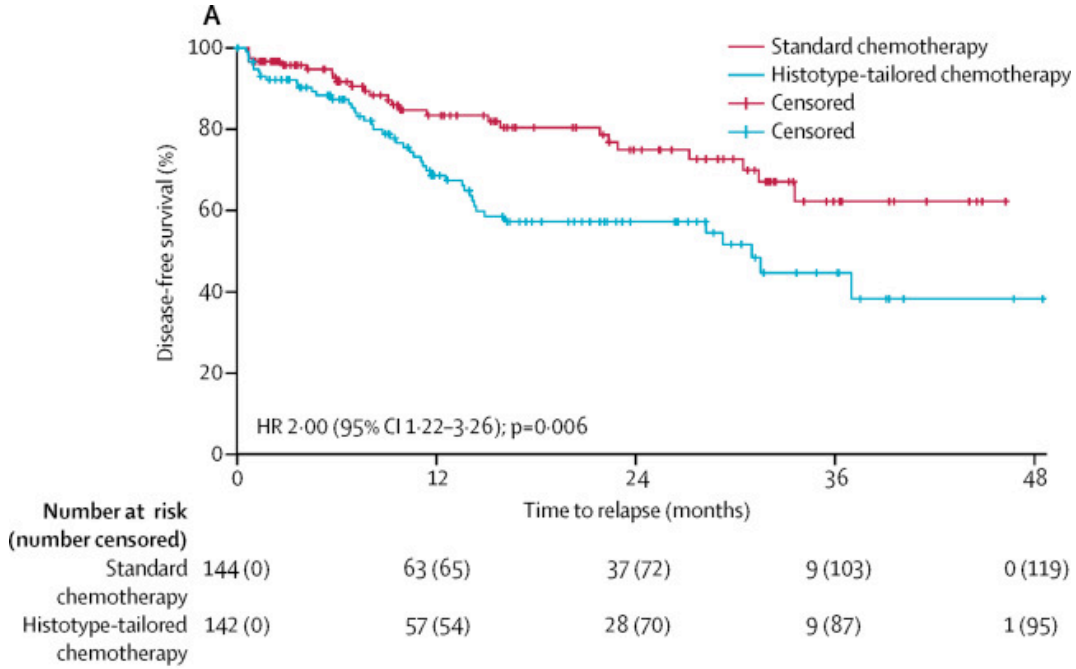
Pasquali et al., *Eur J. Cancer* 2019

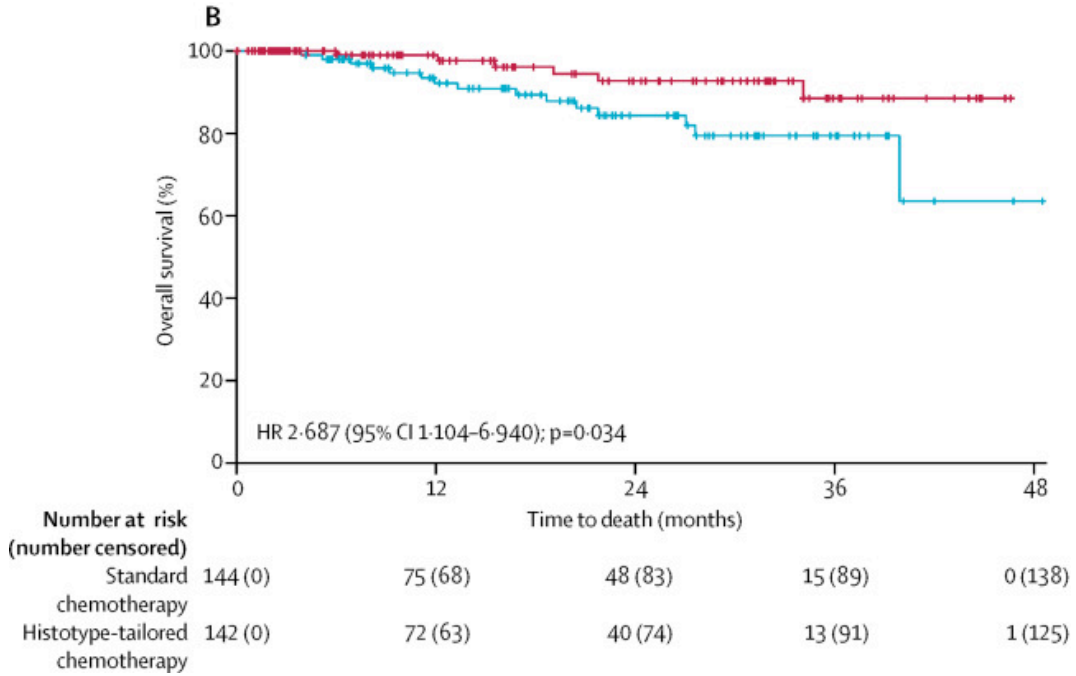
Neoadjuvant Chemo:

For many patients, it makes more sense to give chemotherapy in the neoadjuvant setting.

Neoadjuvant AIM leads to superior outcomes compared with histology-tailored regimens in high risk patients.

Some have interpreted this as a survival benefit for AIM generally.



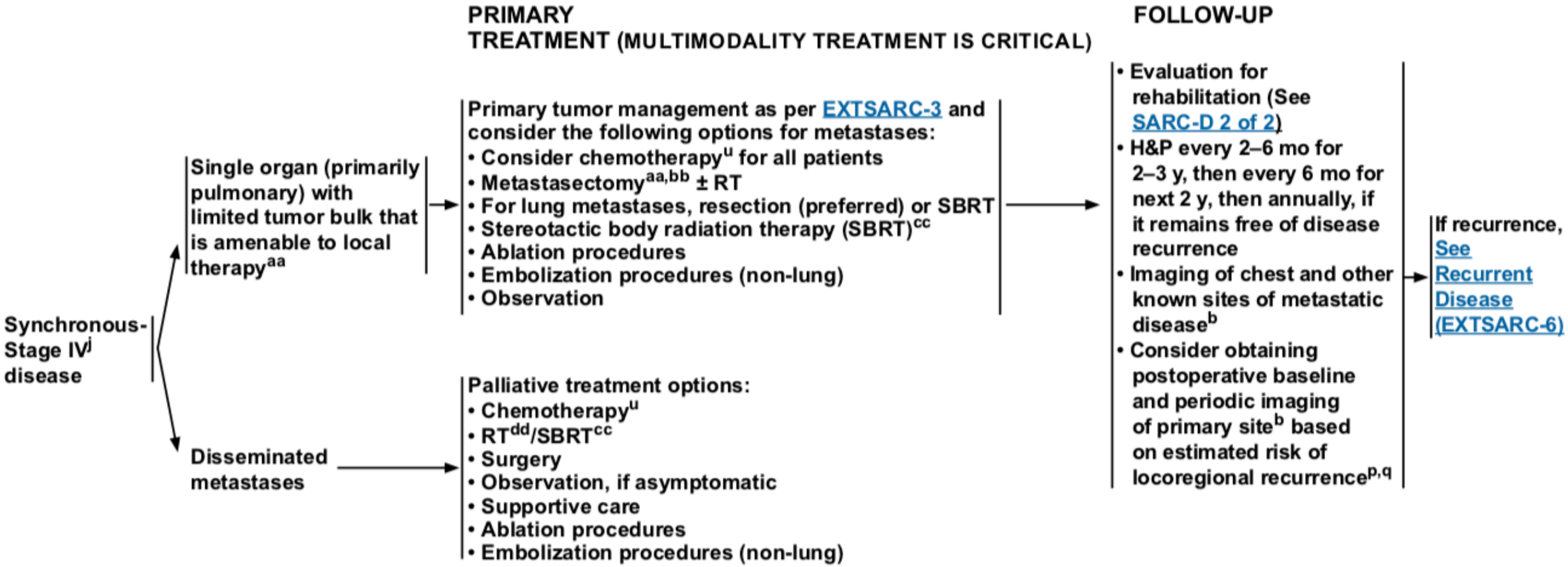


Surveillance

- Chest Imaging Q3-6 months 2-3 years, the every 6 months until 5 years, then annually
- Consider period imaging of primary site.

Options for Metastatic Soft Tissue Sarcoma (according to NCCN):

Note: both surgery and SBRT may be good options for patients with isolated/metastatic disease



NCCN Practice Guidelines 2020

Principals Systemic therapy in soft tissue sarcoma

- Chemotherapy: mainstay of treatment for unresectable/ metastatic disease

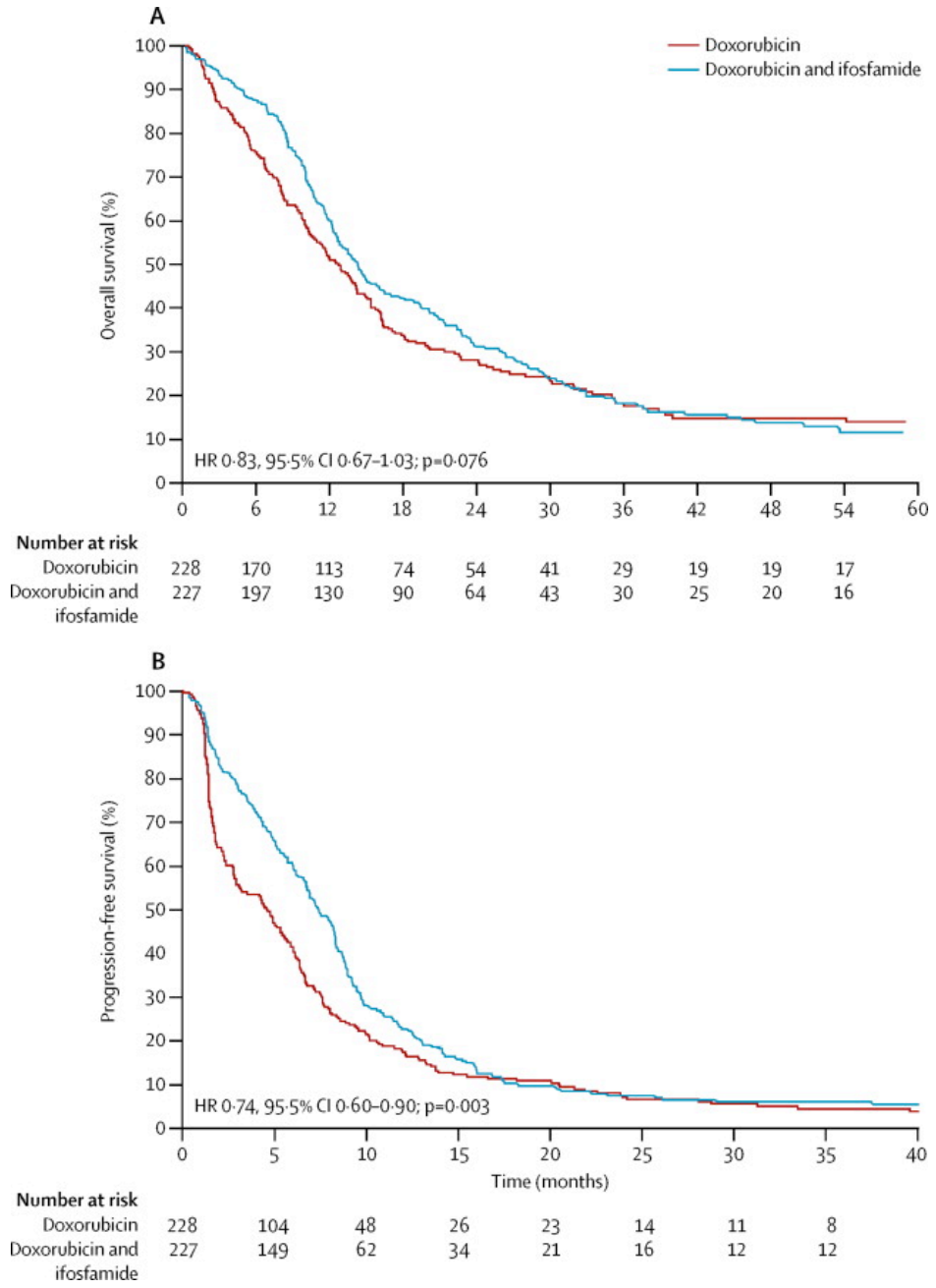
- Previously “one size fits all” approach to therapy:
  - Anthracycline +/- ifosfamide

- Other agents:
  - Gemcitabine/ docetaxel
  - Eribulin
  - Trabectedin
  - Pazopanib
  - Older agents (e.g. decarbazine etc)

Constantinidou A, et al. Expert Rev Anticancer Ther 13(2); 211-23: 2013

Although chemotherapy should be tailored to an individual, anthracycline-based therapy (dox alone or in AIM) is generally the gold standard front line.

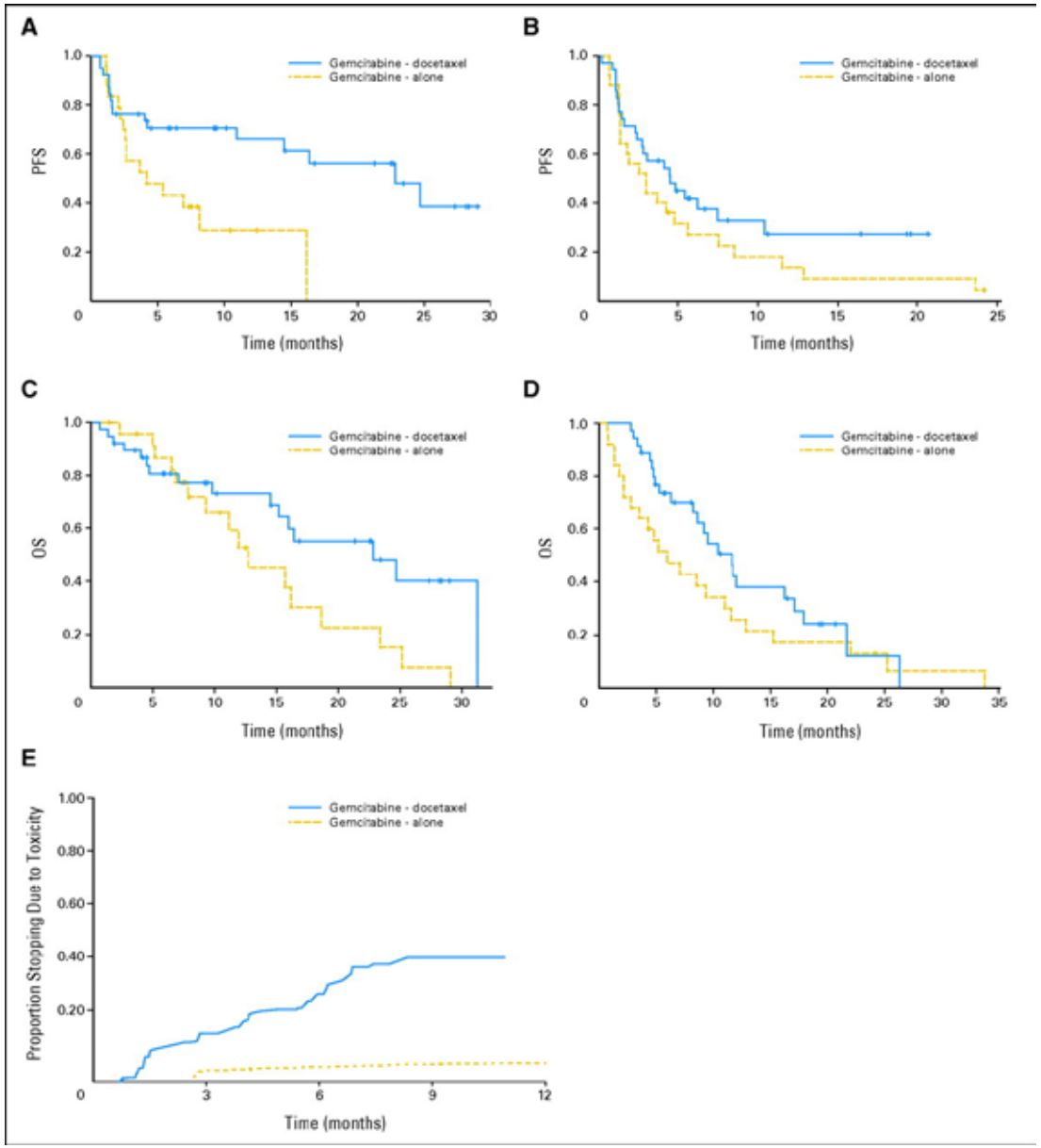
- EORTC randomized Phase III trial:
  - Doxorubicin + ifosfamide versus doxorubicin alone (N=455)
- Median PFS:
  - 7.4 (95%CI, 6.6-8.3) v 4.6 (95%CI, 2.9-5.6) months
  - (HR 0.72, 95%CI; 0.59-0.88, p=0.002)
- Median OS: No significant difference
- Dox+ifos more toxic



Judson I et al, Lancet 2014

Gemcitabine and docetaxel

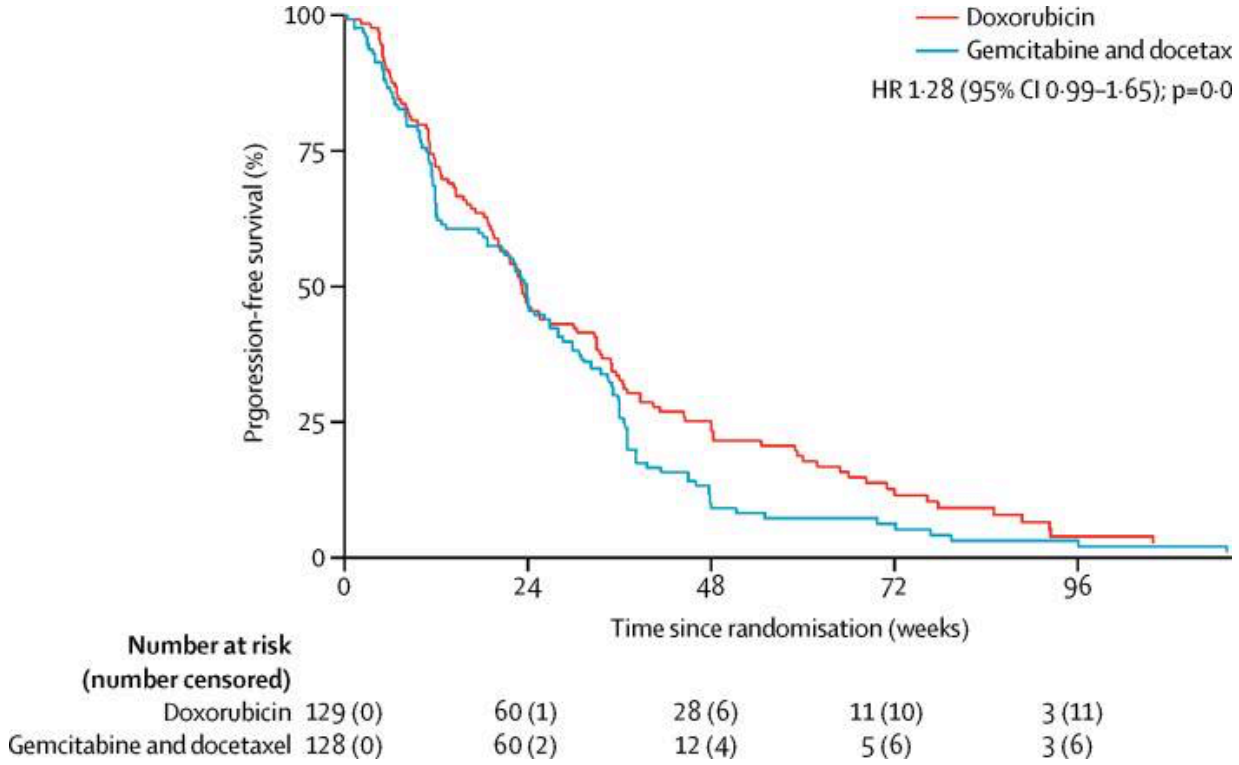
- Randomized Phase II trial, N=122
- Gemcitabine
  - Response rate: 8%
  - Median PFS: 3.0
  - Median OS: 11.5 months
- Gemcitabine/ docetaxel
  - Response rate: 16%
  - Median PFS: 6.2 months
  - Median OS: 17.9 months
- Other Gemcitabine Based Combinations:
  - Navelbine
  - Decarbazine

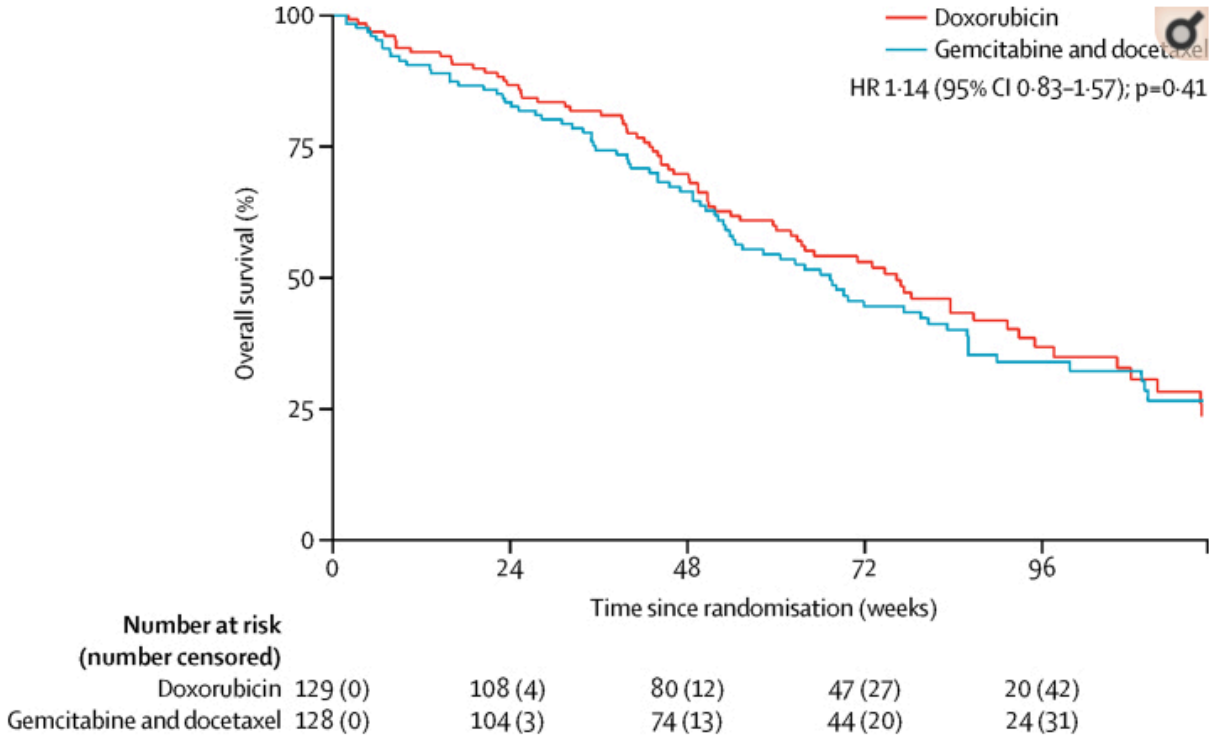


Maki R et al JCO 25; 2755-2763: 2007

Geddis trial: gem/tax vs. dox

No benefit to up front gem/tax instead of dox for STS (including the subset of LMS patients)





Seddon et al., *Lancet* 2017

PFS: Pazopanib Phase III trial

	Placebo	Pazopanib
Median (months)	1.5	4.6
Hazard ratio (95%CI)	1	0.31 (0.24-0.4)
P value	<0.0001	

	N (%)	HR	CI	p-value
Overall	369	0.31	0.24-0.4	<0.0001
LMS	158 (43%)	0.31	0.2-0.47	<0.0001
Synovial	38 (10%)	0.19	0.23-0.6	0.0002
Other	173 (47%)	0.36	0.25-0.52	<0.0001

Van der Graaf WT et al. *Lancet* 6736; 60651-60655: 2012

Eribulin versus dacarbazine in previously treated patients with advanced liposarcoma or leiomyosarcoma: a randomised, open-label, multicentre, phase 3 trial

OS

PFS

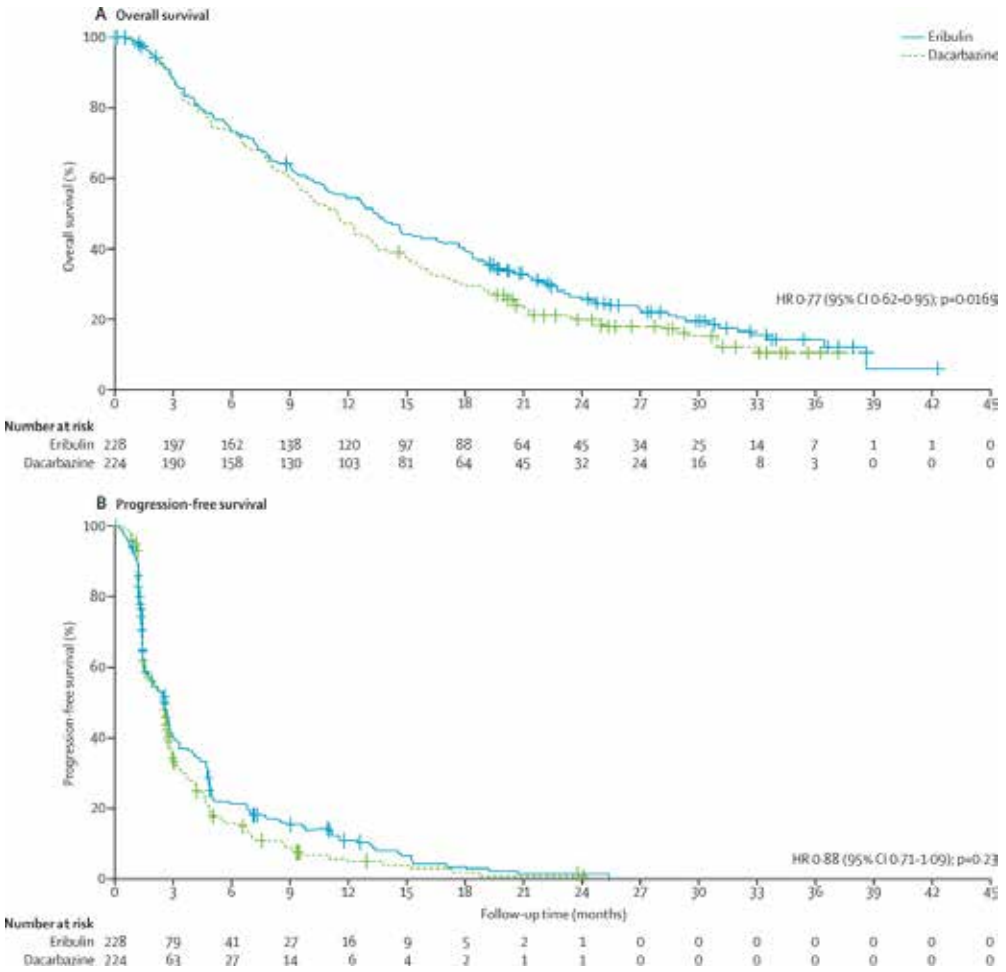
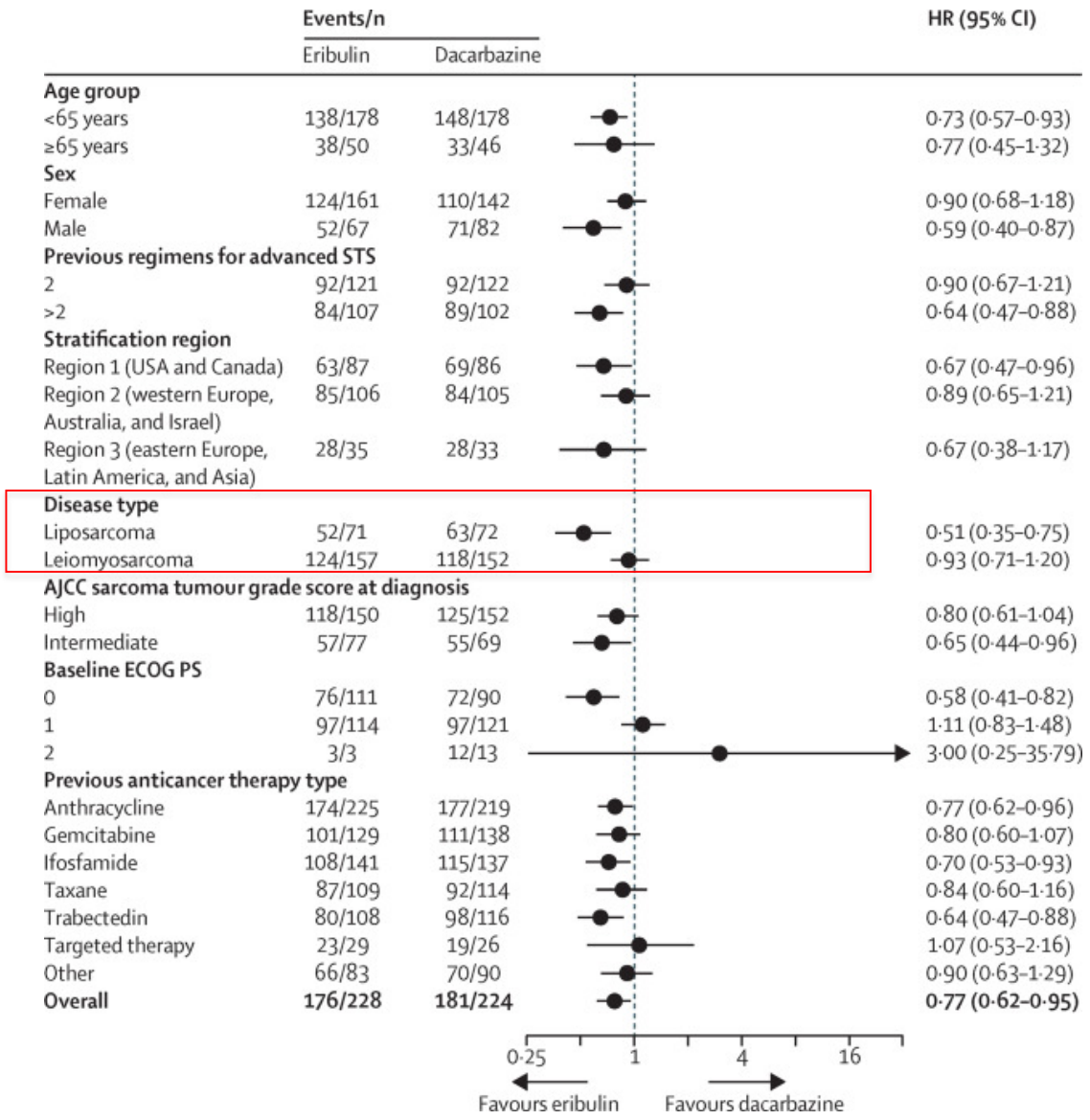


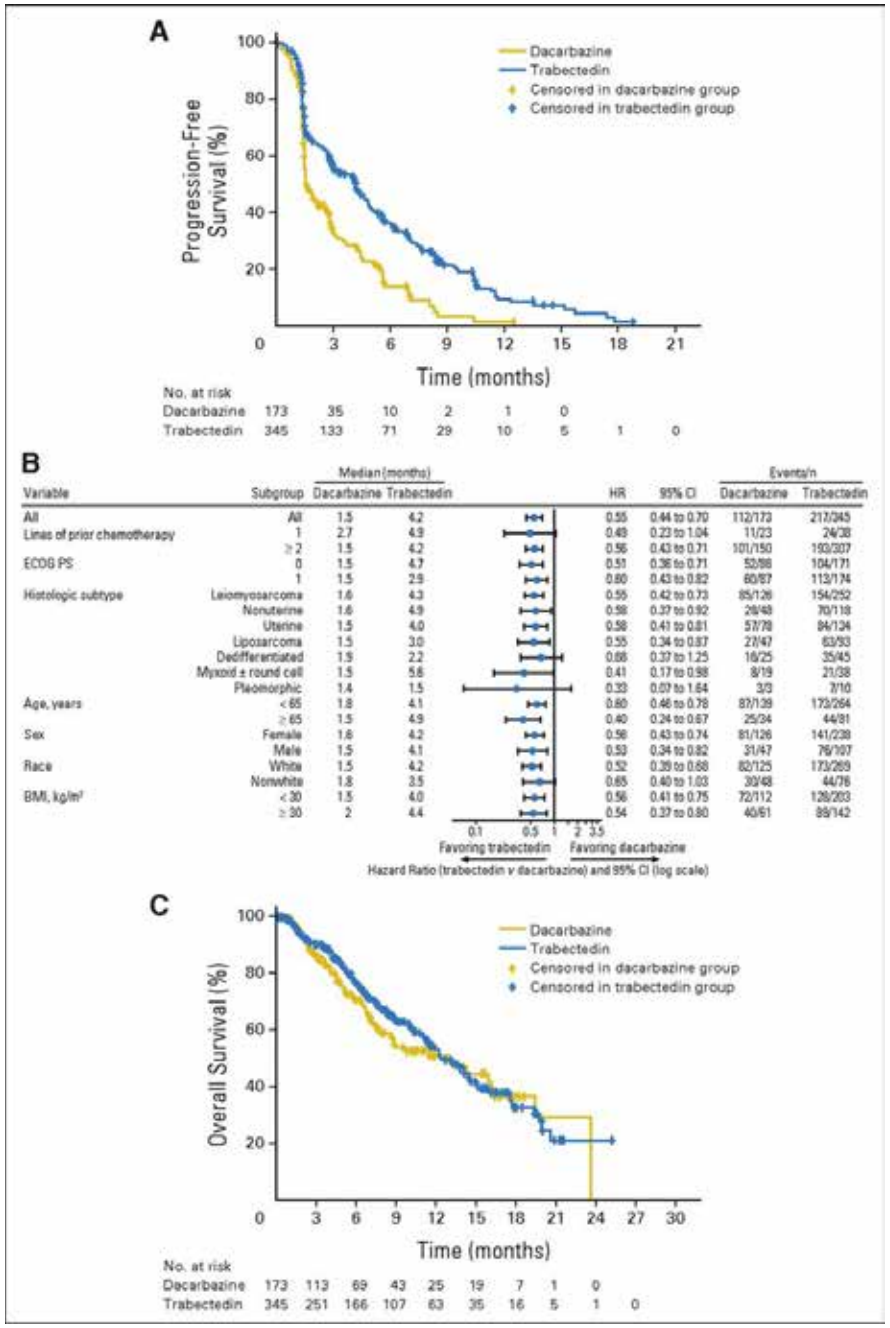
Figure 2. Overall survival (A) and progression-free survival (B)HR=hazard ratio.



Schöffskii et al., Lancet 2016

Trabectedin is FDA approved for liposarcoma and leiomyosarcoma

Kaplan-Meier estimates of progression-free survival, subgroup analyses, and overall survival at the interim analysis.



George D. Demetri et al. JCO 2016;34:786-793

JOURNAL OF CLINICAL ONCOLOGY ASCO

Trabectedin monotherapy after standard chemotherapy versus best supportive care in patients with advanced, translocation-related sarcoma: a randomised, open-label, phase 2 study

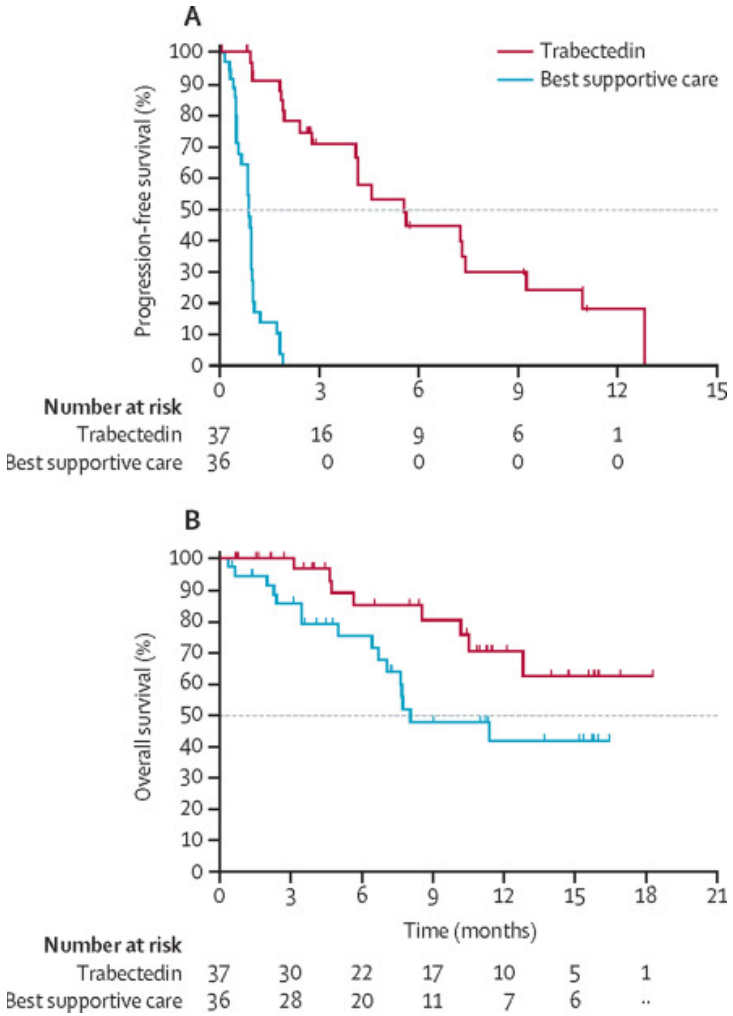


Figure 2. Kaplan-Meier plot of progression-free survival by central radiology imaging review (A) and overall survival (B) in the full analysis set

Akira Kawai et al., Lancet 2016
null, Volume 16, Issue 4, 2015, 406–416
http://dx.doi.org/10.1016/S1470-2045(15)70098-7

Kaposi's Pearls

- HHV8 associated cancer, AIDS defining in setting of HIV
- KS most commonly involves skin. Extracutaneous spread: oral cavity, GI tract, lungs + lymph nodes
- For HIV associated disease, most important is to get HIV under control
- For local disease, surgery. Sytstemic therapy generally not required. Radiation, imiquimod also options.
- For systemic disease, paclitaxel and liposomal doxorubicin are very effective options.

Aversa SM Crit Rev Oncol Hem 53; 253-265: 2005

Histological subtype specific approaches

- **Angiosarcoma:**
  - Paclitaxel
    - Penel et al, JCO 26; 5269-5274: 2008
    - Shlemmer et al, EJC 44; 2433-2436: 2008
- **Perivascular epithelioid cell tumours (PEComa):**
  - mTOR inhibition (sirolimus)
    - Wagner et al, JCO 28; 2010
- **Chordoma:**
  - Imatinib
    - Stacchiotti S et al, JCO 2012
  - Imatinib + sirolimus
    - Stacchiotti S et al, Annals Oncology 20; 1886-1894: 2009

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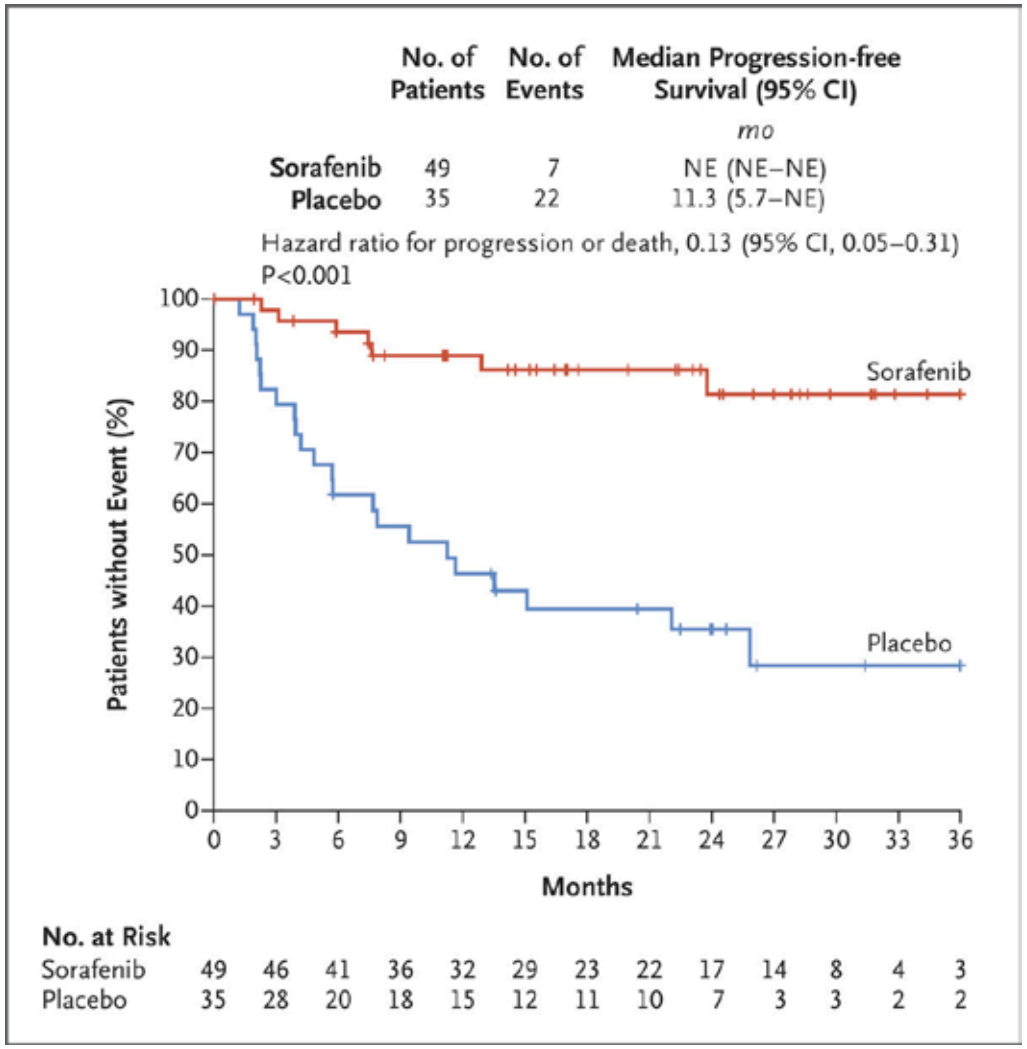
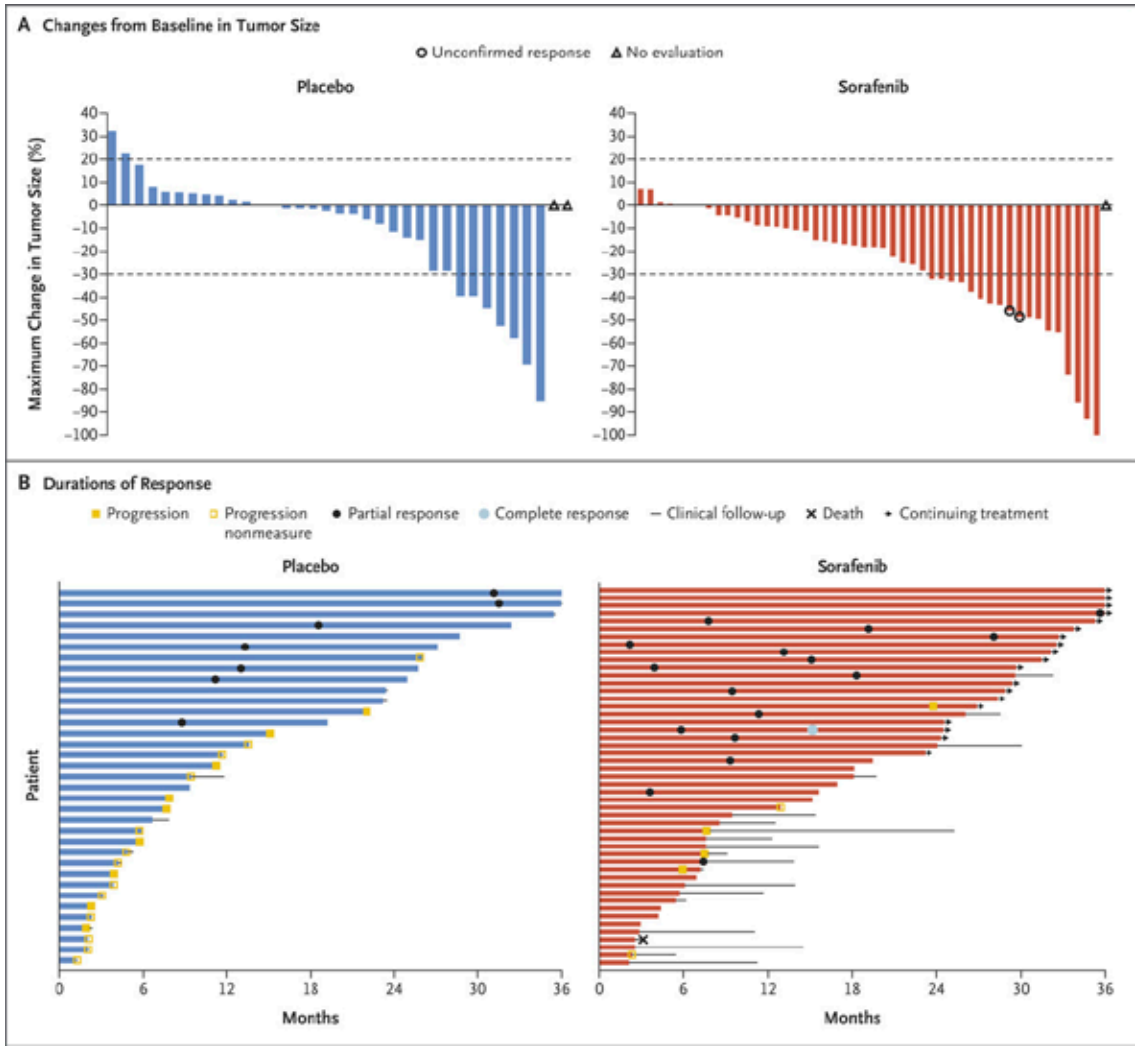
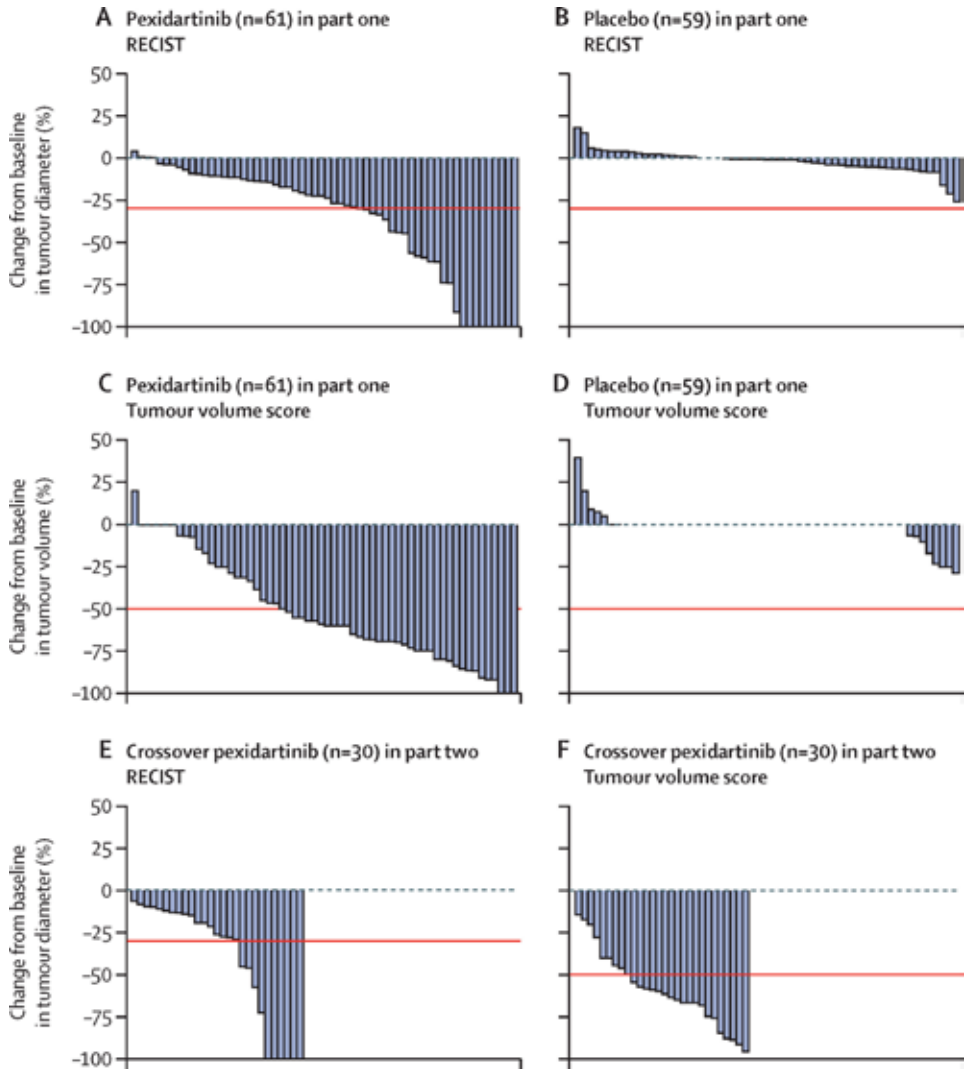
Desmoid Tumors Respond To Sorafenib





MM Gounder et al. N Engl J Med 2018;379:2417-2428.

Tenosynovial Giant Cell Tumor



Histological subtype

- **Giant cell tumor of bone:**
  - **Rank-L driven tumors**
  - **Denusomab**
    - Thomas D et al, Lancet Onc 11; 275-280; 2010
- **Inflammatory myofibroblastic tumours:**
  - ALK mutations (approx. 50%)
  - Crizotinib can be effective
    - Butrynski et al, NEJM 363; 2010

- **Dermatofibrosarcoma:**
  - PDGFB-COL1A1 fusion
  - Imatinib Sensitive
    - Stacchiotti et al., CCR 2016; 22(4)

Key “pearls” for non-GIST Soft Tissue Sarcomas

- Surgery is the mainstay of therapy of treatment for localized disease
- Radiation plays an important role for large/high grade tumors or when wide excision is not feasible.
- The role of chemotherapy for localized disease is a “work in progress”
- AIM has no proven survival benefit over single agent doxorubicin
- Pazopanib, trabectedin and eribulin are important options
- Individual histologic subtypes have unique biologies that can be important therapeutically

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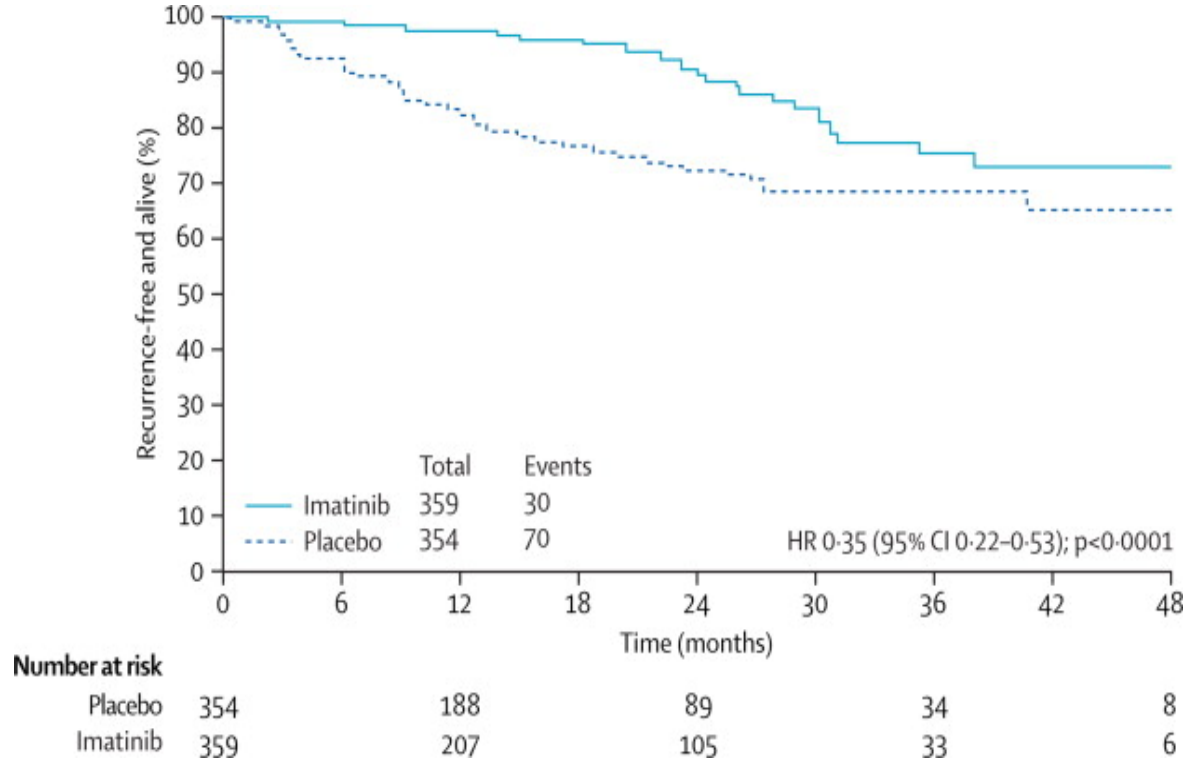
GIST

5000 new cases/year

85%-95% have activating KIT or PDGF mutation



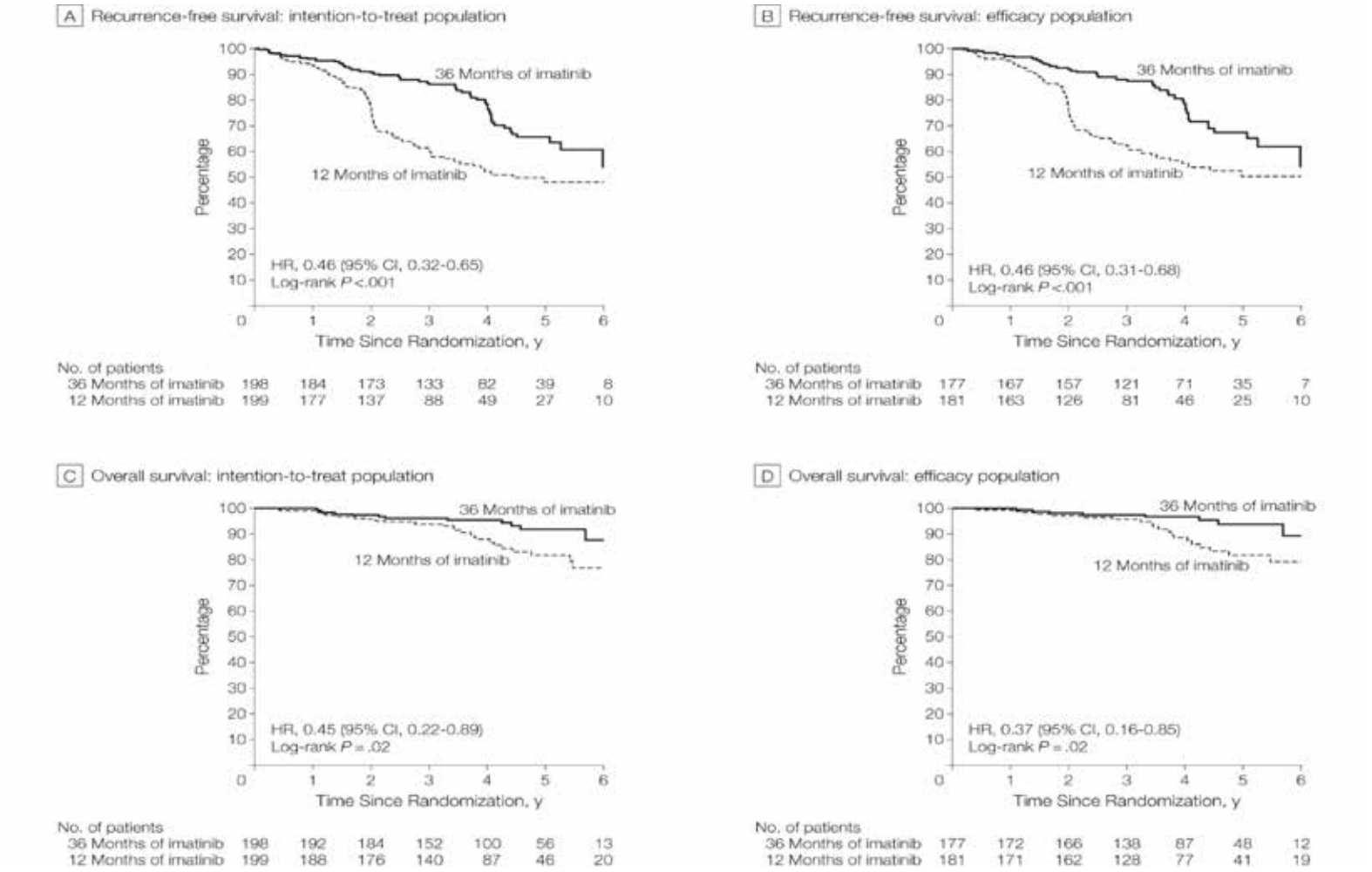
Major Risk Factors

- Size > 5 cm
- Mitosis > 5/ 50 hpf
- Small bowel location

The Original Adjuvant Studies for Imatinib in GIST showed RFS benefits for 1 year of treatment in high risk patient populations.

De Matteo R et al, Annals Surg 231(1): 51-8: 2000

OS Benefit for 3 vs 1 Year of Adjuvant Imatinib: Should you ever stop imatinib?



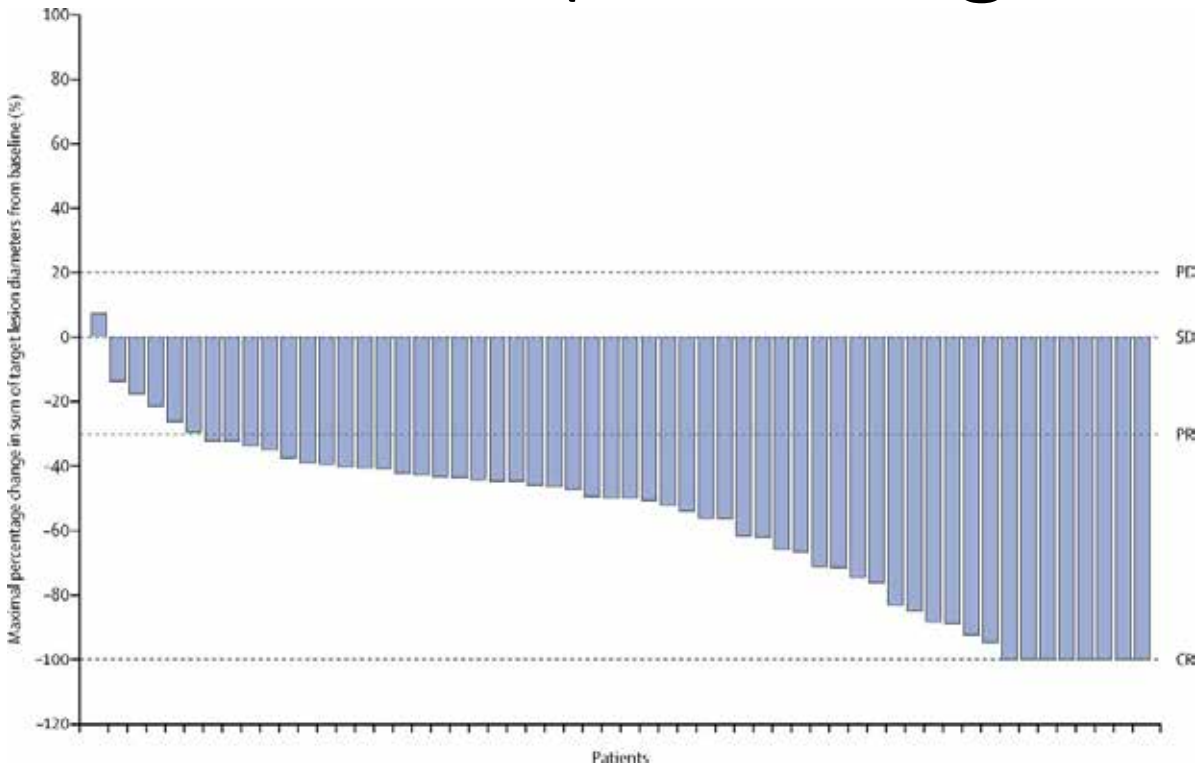
Joensuu H et al, JAMA 307; 1265-1272: 2012

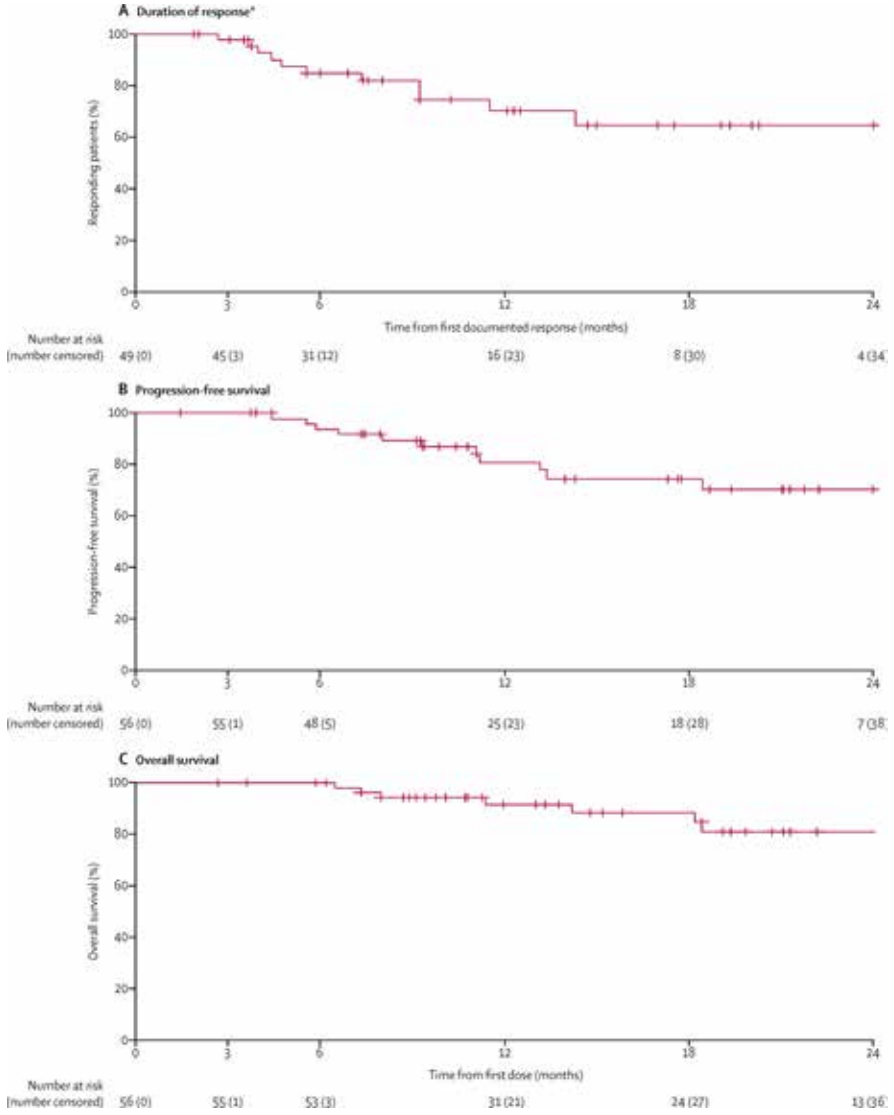
Surveillance

CT abd/pelvis every 3-6 months for 3-5 years then annually

For Metastatic disease: Should Front Line Treatment Always be Imatinib 400mg?

Avapritinib is FDA Approved for Exon 18 mutations of PDGFRA (including D842V)

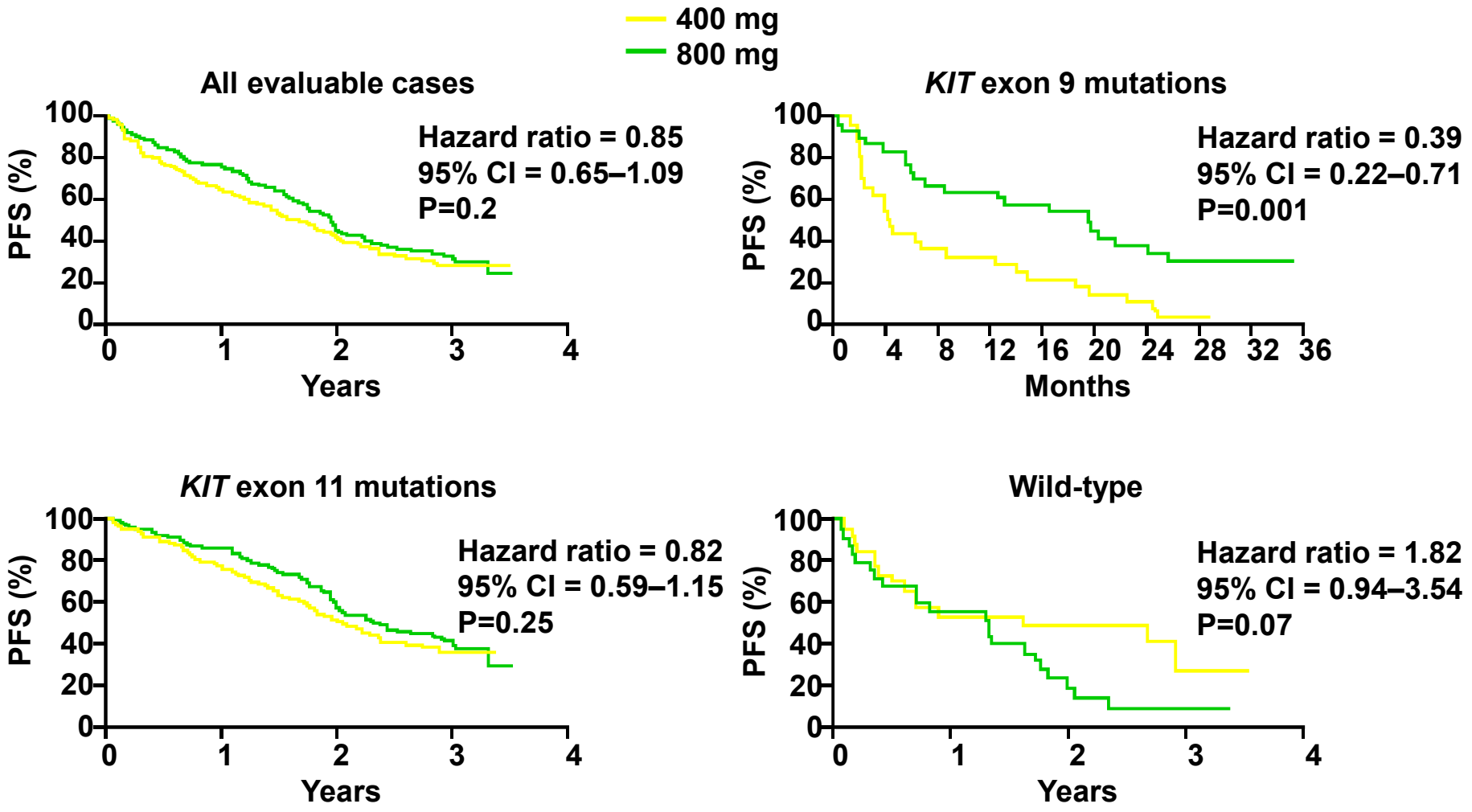




Hinrich et al., Lancet Onc 2020

Imatinib Dose dependency and mutational status

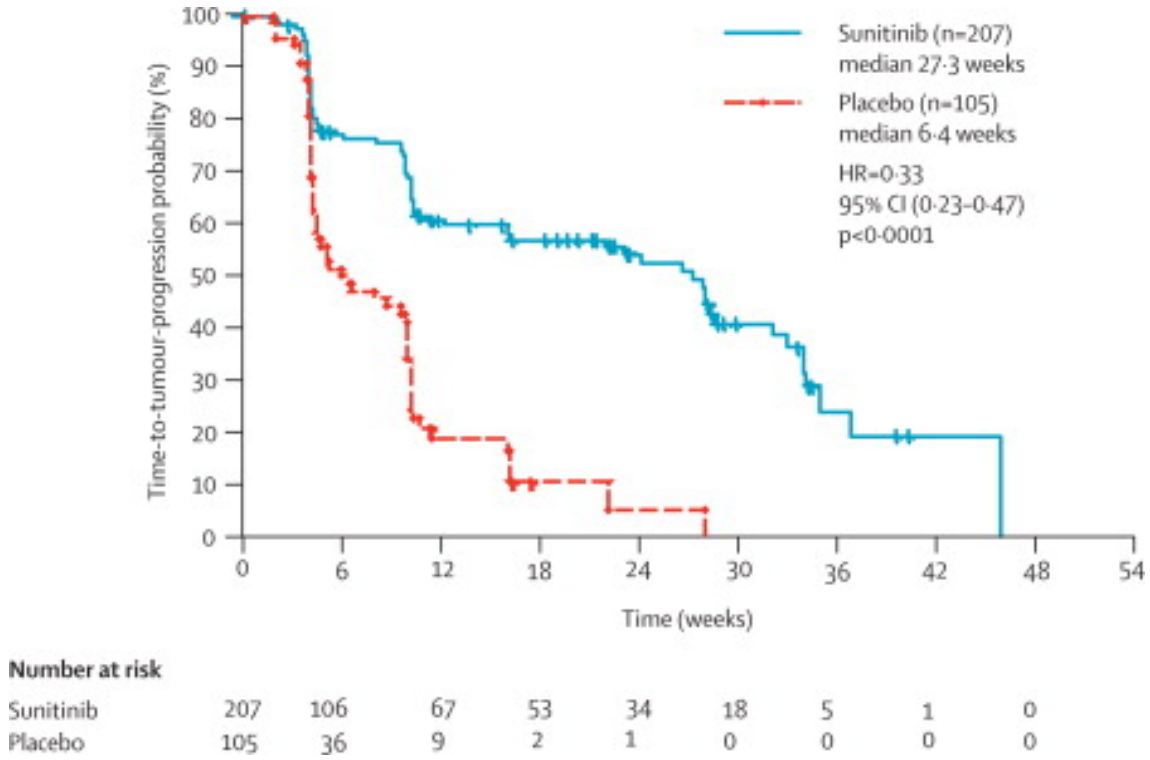
Benefit of using higher dose of imatinib for patients with Exon 9 mutation is probably preserved whether it is started initially or increased at time of progression.



Debiec-Rychter M et al, *Eur J Cancer* 42; 1093–1103: 2006

Sunitinib

- TKI: KIT, PDGFRs, VEGFR 1-3, FLT3
- Phase III: 312 patients randomised to
  - Sunitinib
  - Placebo
- Sunitinib median PFS 24.1 weeks
- Placebo median PFS 6.0 weeks
  - P<0.0001
- OS significantly longer sunitinib arm
  - p=0.007



Demetri G et al, Lancet 368; 1329-1338; 2006

Efficacy and safety of regorafenib for advanced gastrointestinal stromal tumours after failure of imatinib and sunitinib (GRID): an international, multicentre, randomised, placebo-controlled, phase 3 trial

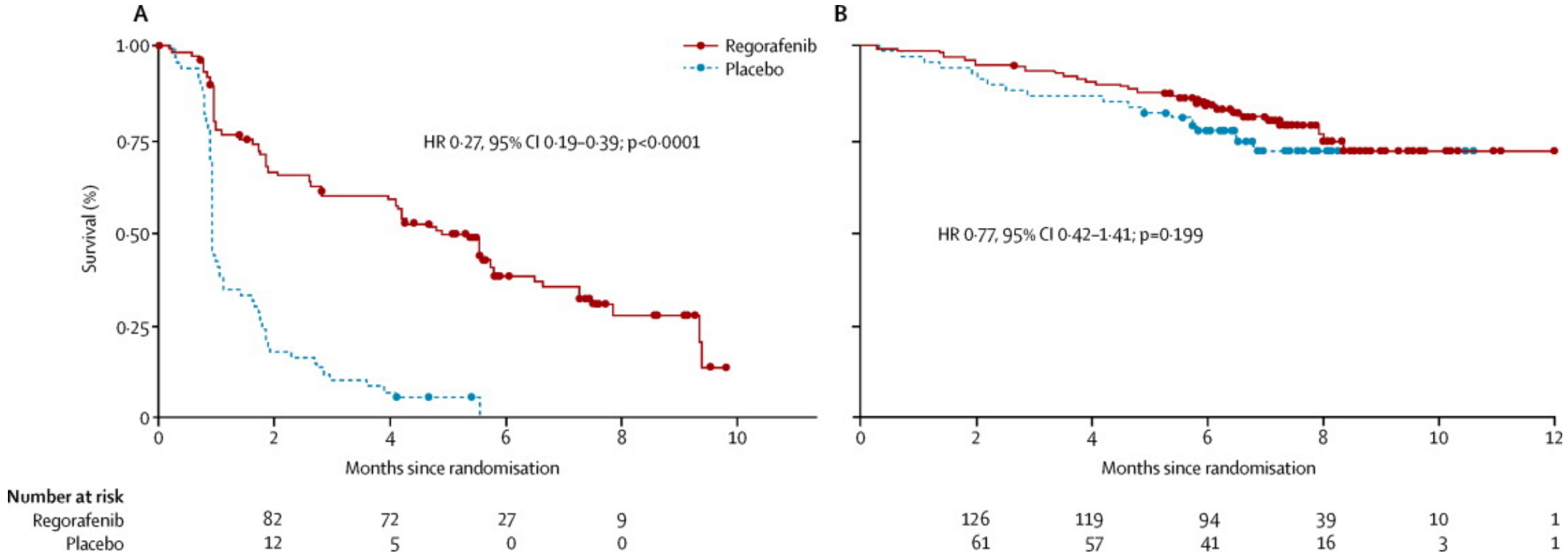
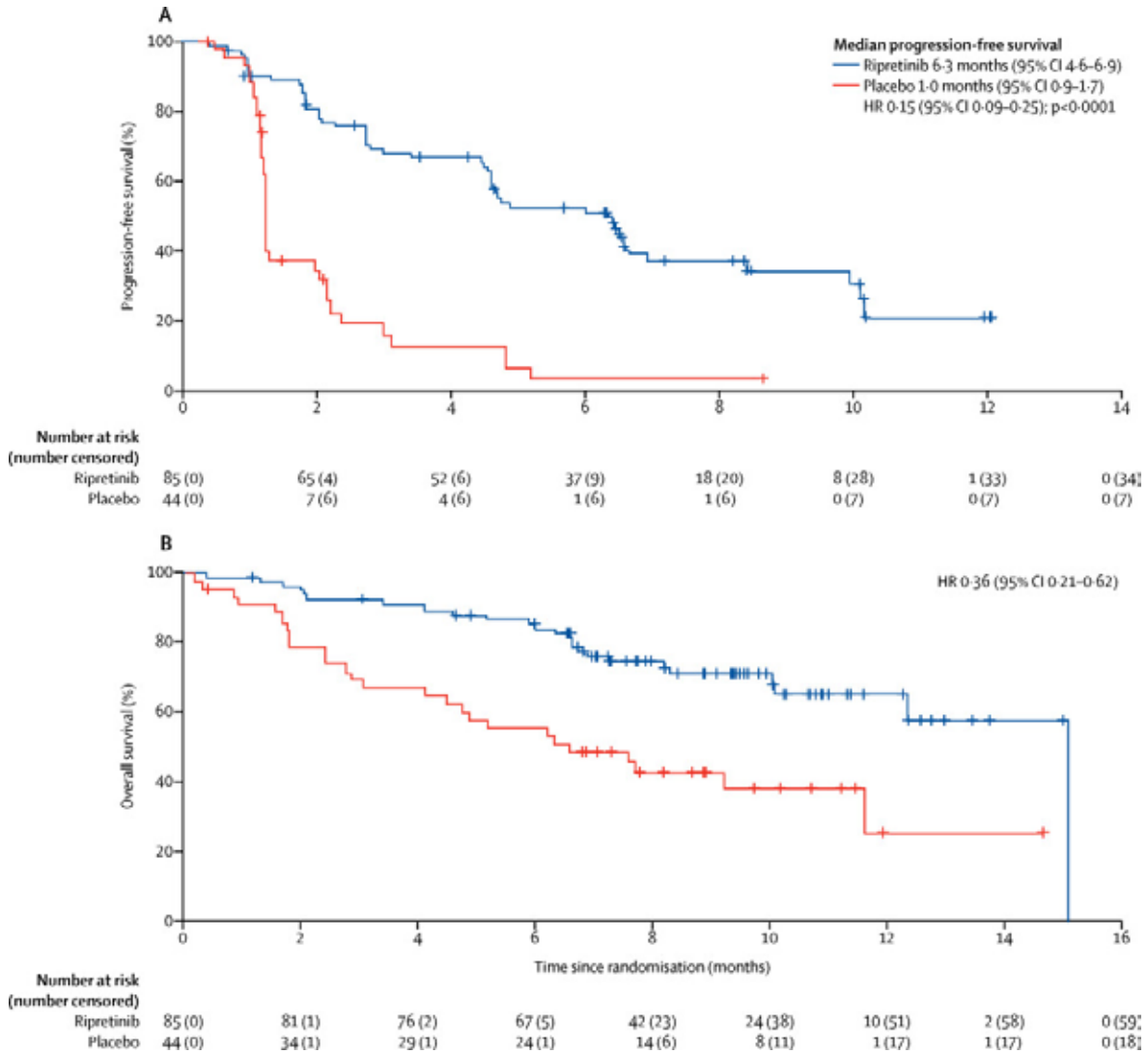


Figure 2. Kaplan-Meier survival analysis after treatment with regorafenib or placebo(A) Progression-free survival, per central review (primary endpoint, final analysis). (B) Overall survival (interim analysis). HR=hazard ratio.

George D Demetri, et al. Lancet Oncology, Issue 9863, 2013, 295–302

http://dx.doi.org/10.1016/S0140-6736(12)61857-1

Repritinib Now Approved for 4th Line GIST



Blay et al., Lancet Oncology 2020

Key “pearls” for GIST

- Size, mitosis, location are important risk factors for localized GIST
- 3 years of adjuvant imatinib improves survival for localized disease
- 800 mg of imatinib is no better than 400 mg except for patients with exon 9 mutation
- Avapritinib should be considered for D842V mutation
- Sunitinib then regorafenib for patients with imatinib refractory metastatic GIST.
- Repritinib is now approved for 4th line

Outline

1) Overview (etiology/risk factors/diagnosis)

Soft Tissue Sarcomas:

2) Non-GIST soft tissue sarcoma

    - Includes treatment of select “benign,” aggressive tumors

3) GIST

4) Bone Sarcomas

- Osteosarcoma
- Ewing sarcoma

Bone Sarcomas

- Osteosarcoma
- Chondrosarcoma
- Ewings Sarcoma

Others: rare bone tumors, Giant Cell tumor of bone

“Classic” Osteosarcoma vs. Ewings Sarcoma Characteristics

Osteosarcoma

- Rarely associated with “B symptoms”
- Predilection for *metaphyseal* region of long bones
- Most common sites: distal femur, proximal tibia, proximal humerus (80-90% occur in long bones)

Ewings Sarcoma

- Frequently associated with “B symptoms.” Patients can sometimes appear quite ill.
- Predilection for *diaphyseal* region of long bones
- Pelvis and ribs also common sites of disease

Both frequnently present with painful bone mass.

Osteosarcoma Epidemiology

- 400 cases/ year USA
- Most common primary bone tumor in children and young adults
- Median age 20 years
  - 30% of cases occur in patients over 40

Treatment Approach in Osteosarcoma

- Intramedullary (>90% of cases – “classical osteosarcoma): almost always high grade. Chemotherapy essential.
- Low grade = excellent prognosis, no need for chemotherapy (regardless of location)
- Parosteal osteosarcoma –generally low grade, much better prognosis: wide excision only. After resection, only if high grade component is found, consider chemotherapy.
- Periosteal osteosarcoma (considered “intermediate” risk): wide excision. If high grade component is seen, use chemo

High Grade Localized Osteosarcoma: Chemotherapy is absolutely critical

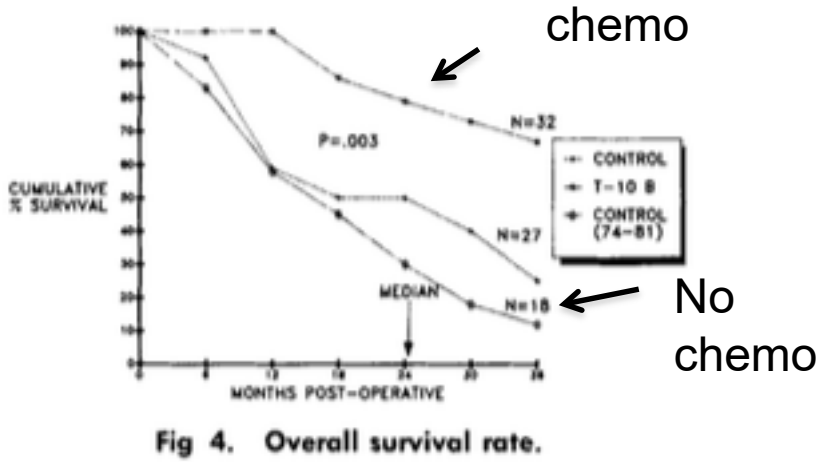


Fig 4. Overall survival rate.

Eilber F et al. J Clin Oncol 5; 21-26: 1987

- Doxorubicin based chemotherapy (generally with cisplatin) is critical for all osteosarcoma patients
- High Dose Methotrexate is often given to younger patients (with less evidence)

Link MP et al. N Engl J Med 314; 1600-1606: 1986

Histological Response to Neoadjuvant Chemotherapy: Predictor of Outcome

- 5-year survival:
  - 75-80% for good responders (>90% tumor necrosis) compared
  - 45-55% for poor responders.

- Patients with little or no necrosis at surgery still benefit from chemotherapy compared to surgery alone.

Bielack SS et al. JCO 3; 776-90: 2002
Souhami RL et al. Lancet 350; 911-17: 1997
Bramwell V et al. JCO 10; 1579-91; 1992

Surveillance in bone tumors

- Chest Imaging Q3-6 months 2-3 years, the every 6 months until 5 years, then annually
- Consider period imaging of primary site.

Recurrent Osteosarcoma

- Five-year survival: 23-29%
  - Complete surgical resection required to achieve cure
- No standard chemotherapy schedule
  - Clinical trial participation
- Other treatment options:
  - Radiation to metastatic sites
  - Samarium-153
  - Bisphosphonates
  - Radiofrequency ablation

Ferrari S et al. J Clin Oncol 21; 710-715: 2003
Kempf-Bielack B et al. J Clin Oncol 20; 559-568: 2005

Ewing Sarcoma: Epidemiology

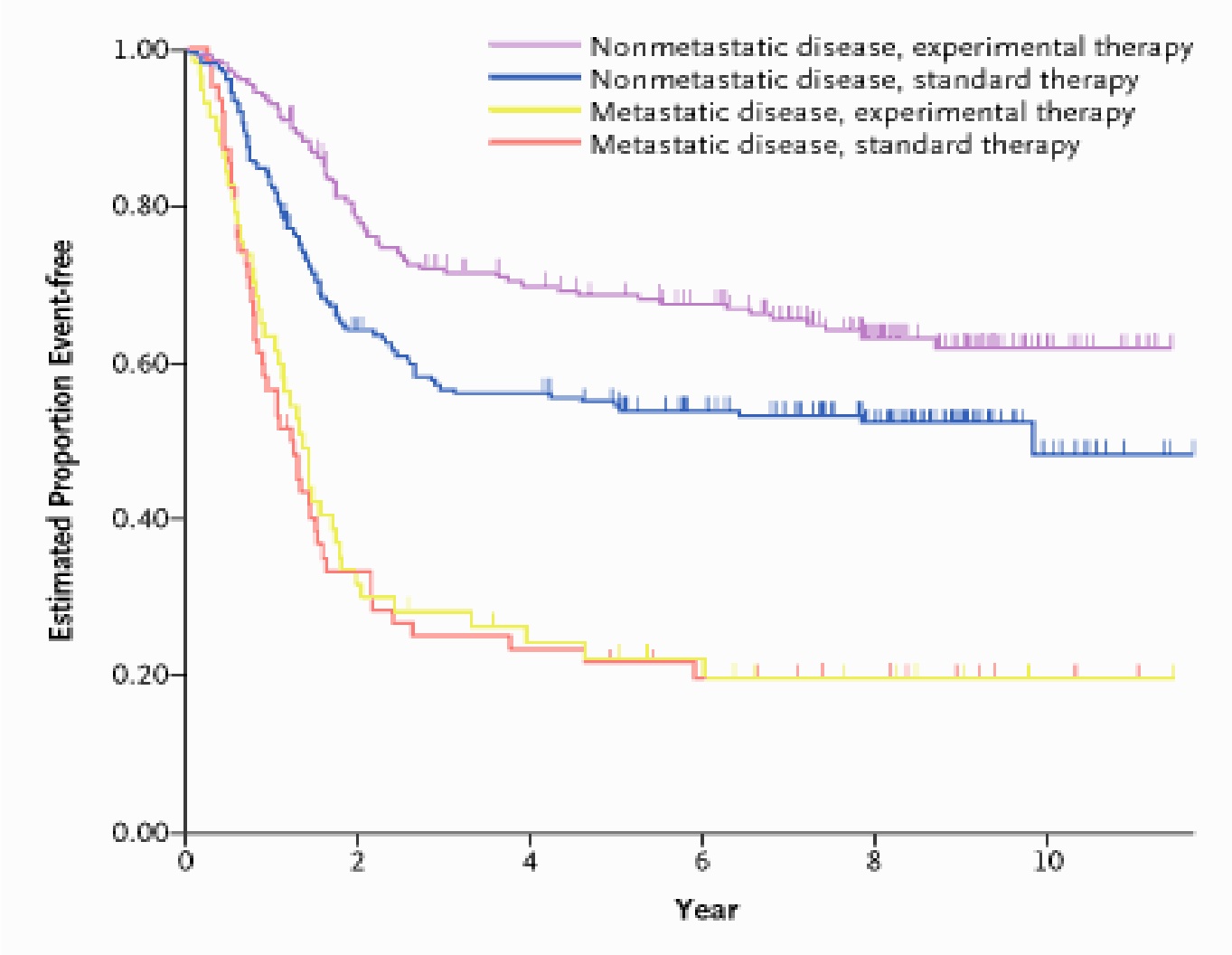
- 200 cases/ year
- Second most common bone malignancy in children and adolescents
- Peak incidence between ages 10 and 20 years
  - 20% of cases in older patients
  - Slight male predominance (1.4:1)
  - Mainly occurs in Caucasians
- No hereditary or congenital syndromes
- No known risk factors

Ewing Sarcoma: Management

- Chemotherapy and radiotherapy sensitive
  - Surgery/ radiation only: <10% 4 year EFS
  - Multimodal therapy including chemotherapy: >70% year EFS

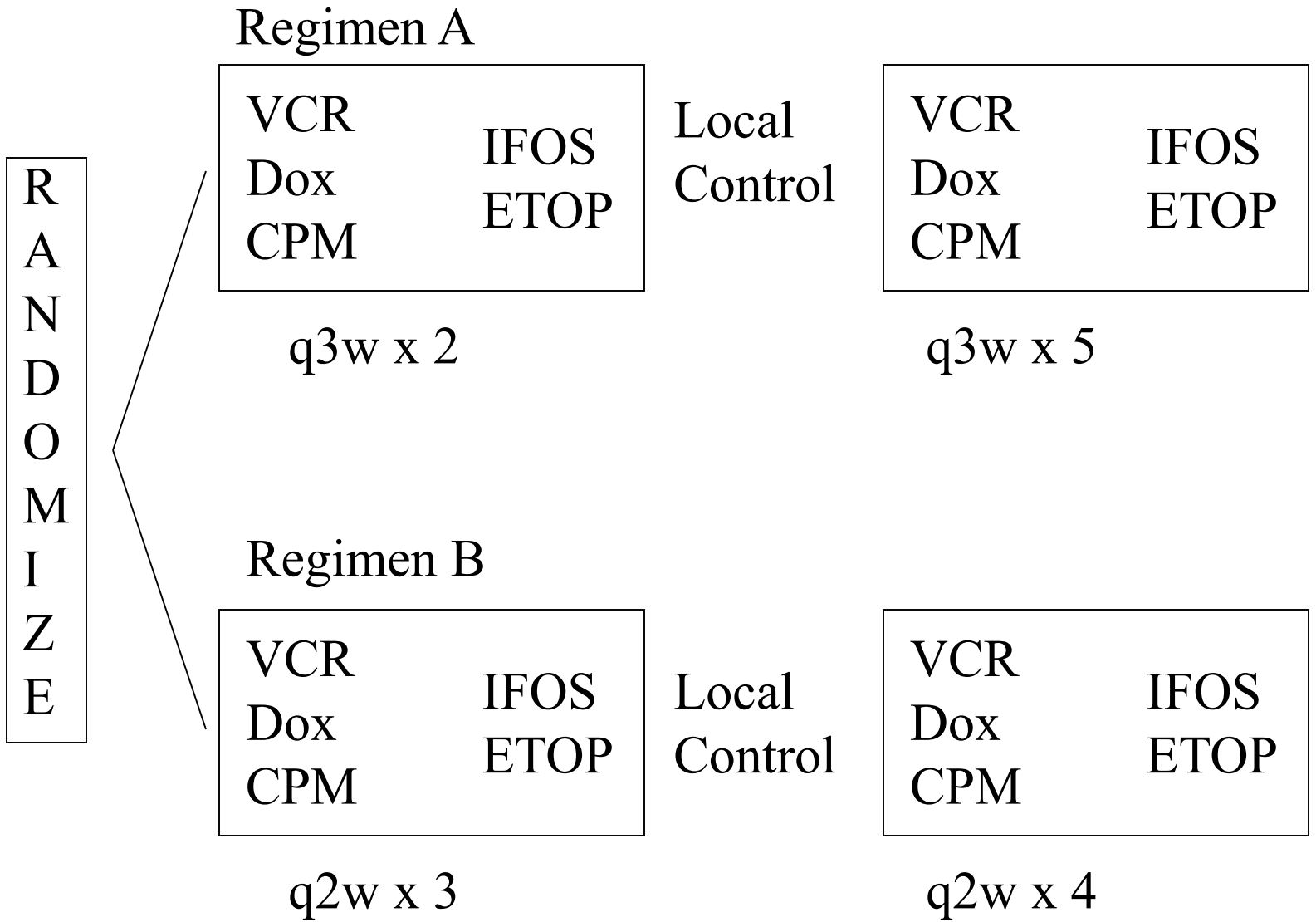
- Poor prognostic factors:
  - Age
  - Metastasis at diagnosis
  - Poor histological response to therapy
  - Tumor size
  - Large pelvic tumors

Addition of ifosfamide/VP-16

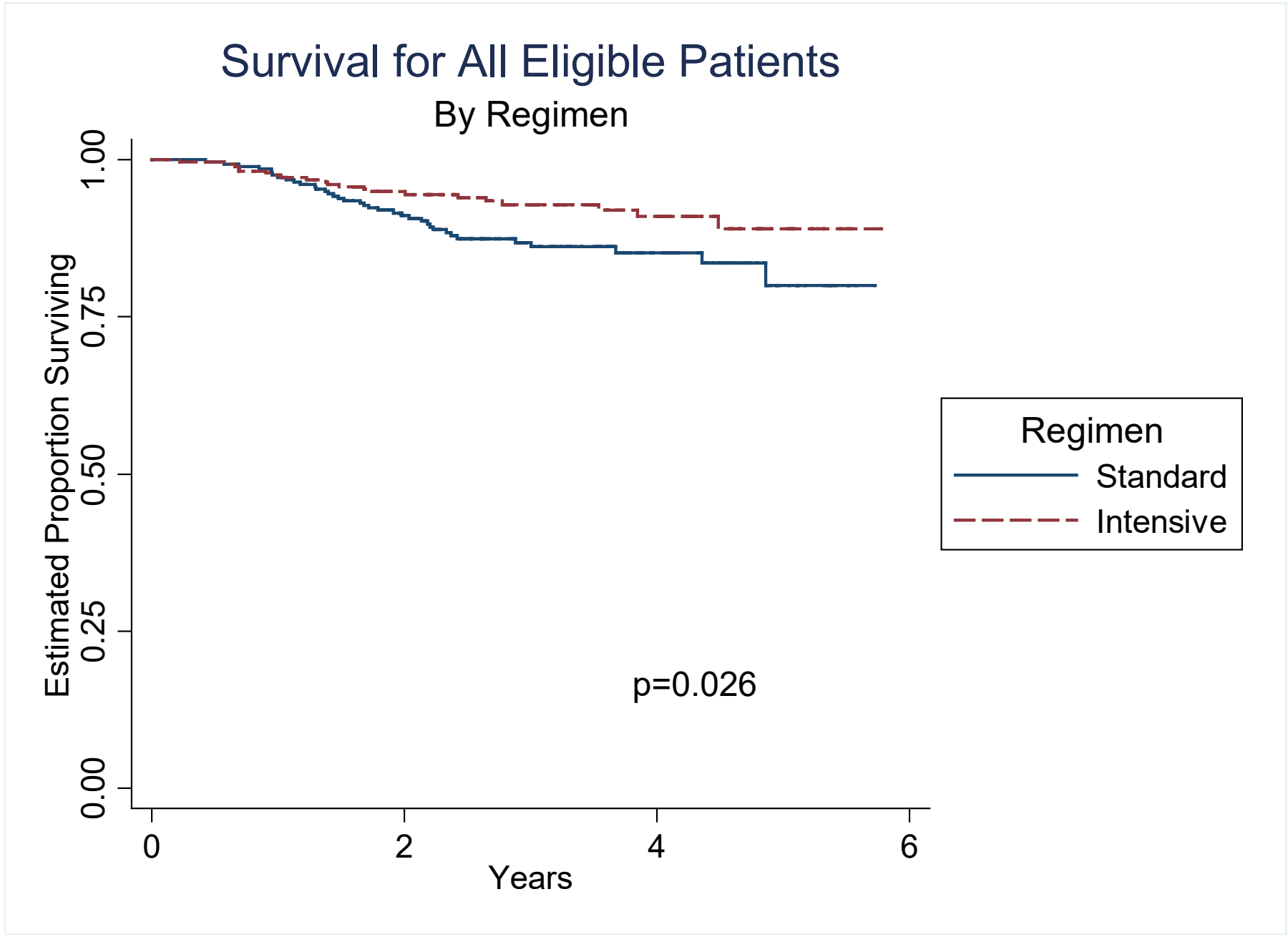


Grier et al. NEJM 348; 694-701: 2003

COG AEWS0031: dose-dense therapy in Ewing family tumors



Womer RB et al, J Clin Oncol 30(33); 4148-4154: 2012



Womer RB et al, J Clin Oncol 30(33); 4148-4154: 2012

Recurrent/ Metastatic Ewing

- 5-year relapse-free survival in metastatic patients:[1]
  - 29% lung only
  - 19% bone only
  - 8% combined lung and bone

- Relapsed: Long-term survival $\leq$ 20%

- Salvage chemotherapy schedules:
  - Irinotecan + temozolamide[2]
  - Cyclophosphamide + topotecan[3]
  - Gemcitabine + docetaxel[4]

- High dose chemotherapy: Benefit uncertain[5]

[1]Cotterill et al JCO 18; 3108-3114: 2000
[2]Wagner LM et al. Ped Blood Cancer 48; 132-139: 2007
[3]Saylors RL et al. J Clin Oncol 19; 3463-3469: 2001
[4]Navid F et al. Cancer 113: 419-425: 2008
[5]Balamuth NJ, Womer RB. Lancet Onc 11; 184-192: 2010

Key “pearls” for Bone Tumors

- Doxorubicin based chemotherapy makes a **huge** impact on survival for Ewings and high grade osteosarcoma. Don’t ever miss this one.
- Necrosis following chemotherapy is a predictor of survival in osteosarcoma but doesn’t change your treatment
- Ifosfamide improves survival for patients with Ewings Sarcoma
- An interval compressed schedule improves survival in young patients with Ewings sarcoma.

Sarcoma: Conclusion

- Each subtype is different
- Surgical resection: mainstay for localized disease
- Chemotherapy is controversial for most localized soft tissue sarcomas, critical for Ewings sarcoma and Osteosarcomas
- GIST – 3 years adjuvant imatinib for high risk disease. Imatinib, sutinib, regorafenib, repritinib in metastatic disease
- Lack of options in the advanced setting, more research is needed.