ATUALIZAÇÃO

NEUROBLASTOMA E TUMOR DE WILMS

Beatriz de Camargo
Programa de Hematologia-Oncologia Pediatrica
CPq

- **Incidência**
- **Clinica**
- **Fatores prognósticos**
- **Tratamento**

  enfase tratamento cirurgico

de Camargo et al. BMC Cancer 2011, 11:160
http://www.biomedcentral.com/1471-2407/11/160

BMC Cancer

RESEARCH ARTICLE Open Access

Socioeconomic status and the incidence of non-central nervous system childhood embryonic tumours in Brazil

Beatriz de Camargo[1*†], Juliana Moreira de Oliveira Ferreira[2†], Rejane de Souza Reis[2], Sima Ferman[3], Marceli de Oliveira Santos[2] and Maria S Pombo-de-Oliveira[1]

INCA INSTITUTO NACIONAL DE CÂNCER

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Table 1 Age adjusted incidence rate (AAIR) per million for embryonal tumours in 13 Brazilian PBCR

PBCR	AAIR* (0 to 14 years)							
	NB	95% CI	RB	95% CI	WT	95% CI	HB	95% CI
Aracaju (1996-2000)	5.90	(-0.78;12.58)	6.99	(0.09;13.90)	10.93	(2.13;19.72)	1.97	(-3.45;7.39)
Campinas (1991-1995)	5.63	(11.11;10.16)	7.58	(2.31;12.85)	9.53	(3.61;15.45)	1.52	(-1.43;4.46)
Curitiba (1998 - 2002)	14.18	(8.60;19.75)	3.52	(0.70;6.34)	5.76	(2.19;9.34)	0.00	-
Distrito Federal (1999-2002)	7.13	(3.63;10.64)	3.80	(1.17;6.44)	10.47	(6.18;14.77)	0.48	(-0.83;1.78)
Fortaleza (1998-2002)	2.40	(0.61;4.19)	3.55	(1.35;5.76)	6.37	(3.42;9.32)	0.00	-
João Pessoa (2000-2004)	3.54	(-0.52;7.60)	4.32	(-0.57;9.20)	12.37	(4.26;20.49)	0.00	-
Manaus (1999-2002)	2.33	(0.05;4.61)	5.83	(2.22;9.44)	6.29	(2.57;10.01)	1.59	(-0.96;4.14)
Natal (1998-2001)	4.60	(0.08;9.12)	12.67	(4.33;21.02)	5.18	(0.03;10.33)	0.00	-
Porto Alegre (1998-2002)	11.82	(6.16;17.48)	7.54	(2.87;12.21)	13.56	(7.43;19.69)	2.78	(-1.08;6.64)
Recife (1997-2001)	11.18	(5.98;16.38)	4.98	(1.51;8.45)	13.48	(7.92;19.04)	0.43	(-0.75;1.60)
Salvador (1998-2002)	4.91	(2.24;7.57)	6.59	(3.54;9.65)	9.48	(5.83;13.13)	2.13	(-0.27;4.53)
Goiânia (1999-2003)	11.51	(5.65;17.37)	8.34	(3.17;13.51)	18.03	(10.63;25.44)	0.00	-
São Paulo (1998-2002)	9.60	(7.80;11.41)	9.08	(7.32;10.85)	8.52	(6.84;10.19)	0.80	(0.07;1.54)
Median	**5.90**		**6.59**		**9.48**		**0.43**	

* per million.

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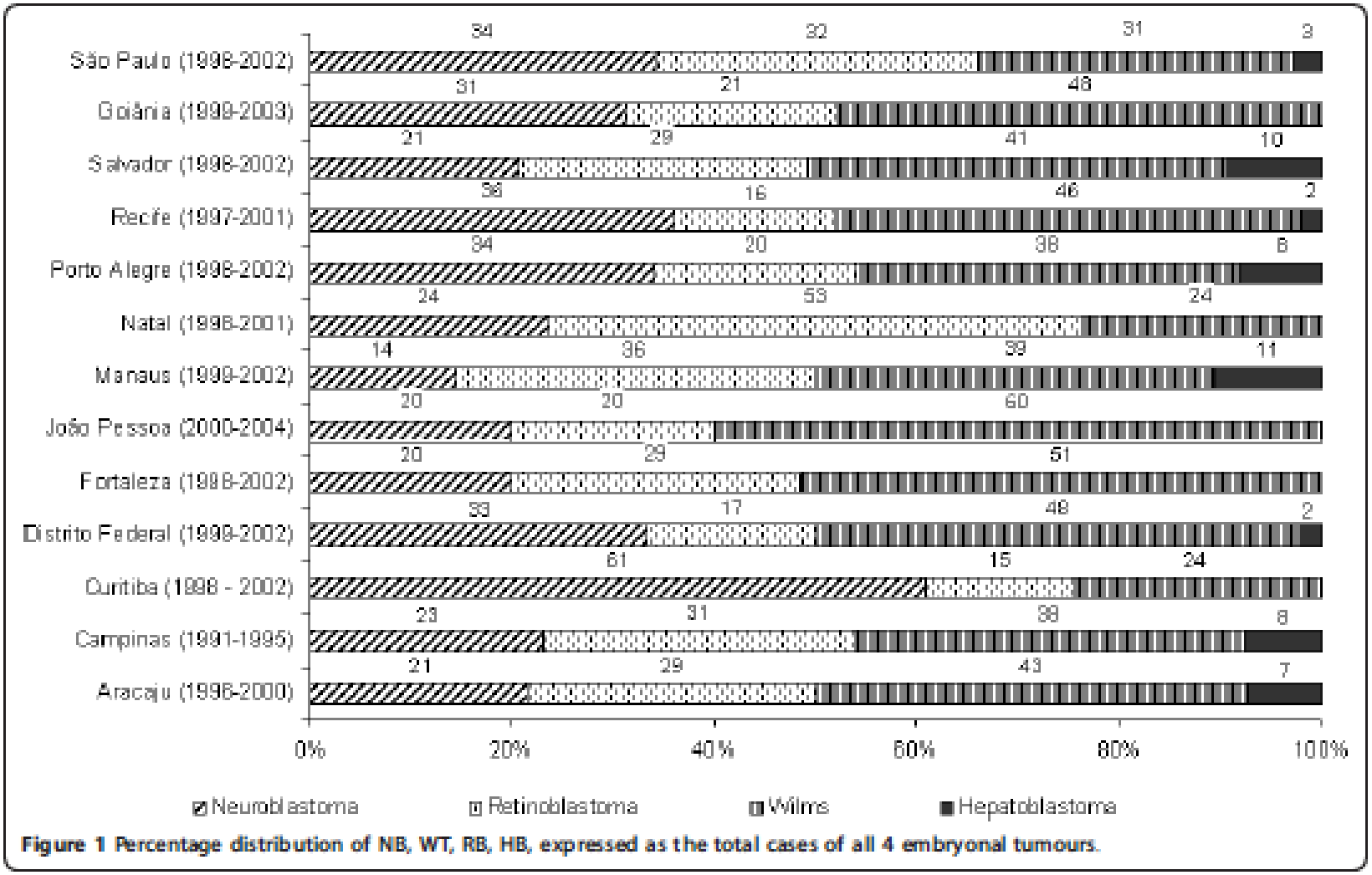

Figure 1 Percentage distribution of NB, WT, RB, HB, expressed as the total cases of all 4 embryonal tumours.

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Socioeconomic status and the incidence of non-central nervous system childhood embryonic tumours in Brazil

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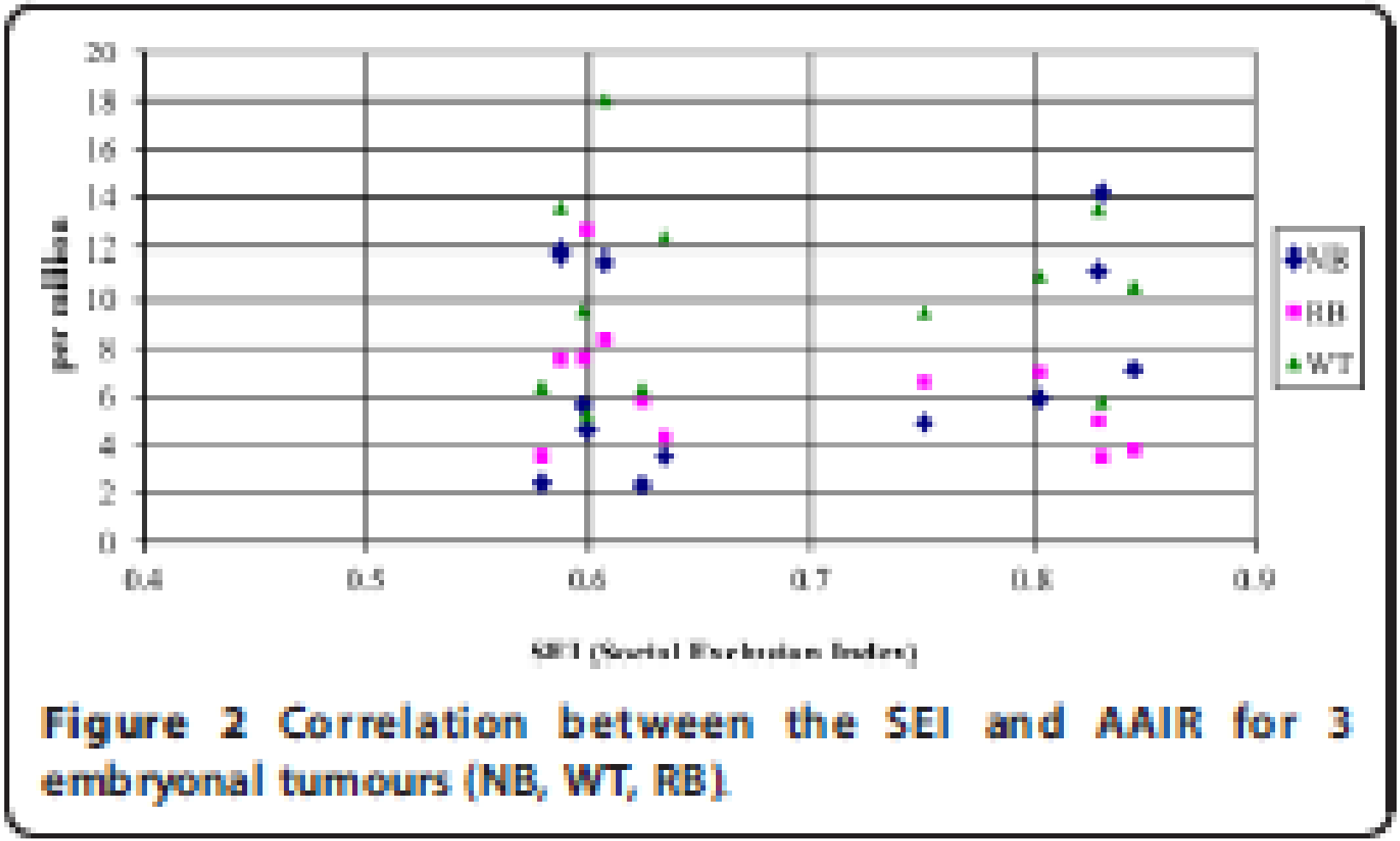
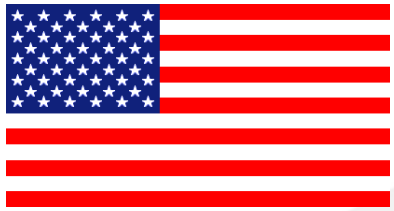
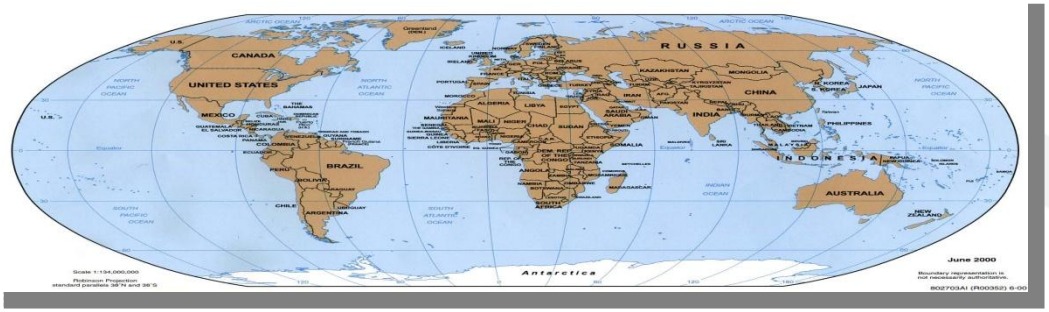


Figure 2 Correlation between the SEI and AAIR for 3 embryonal tumours (NB, WT, RB).

Tratamento TUMOR DE WILMS





NWTS

Nefrectomia Primária

Estadio/histologia

Quimioterapia
+- radioterapia

SIOP

Quimioterapia pré-operatório

Cirurgia

Estadio/histologia

Quimioterapia
+- radioterapia

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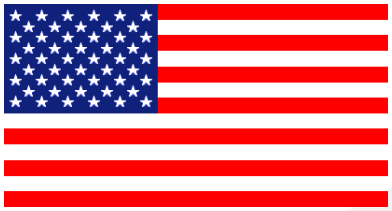
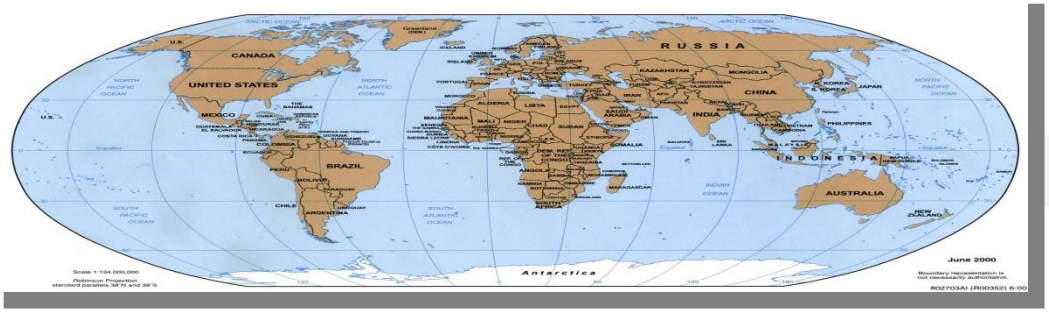
Sobrevida **Morbidade**

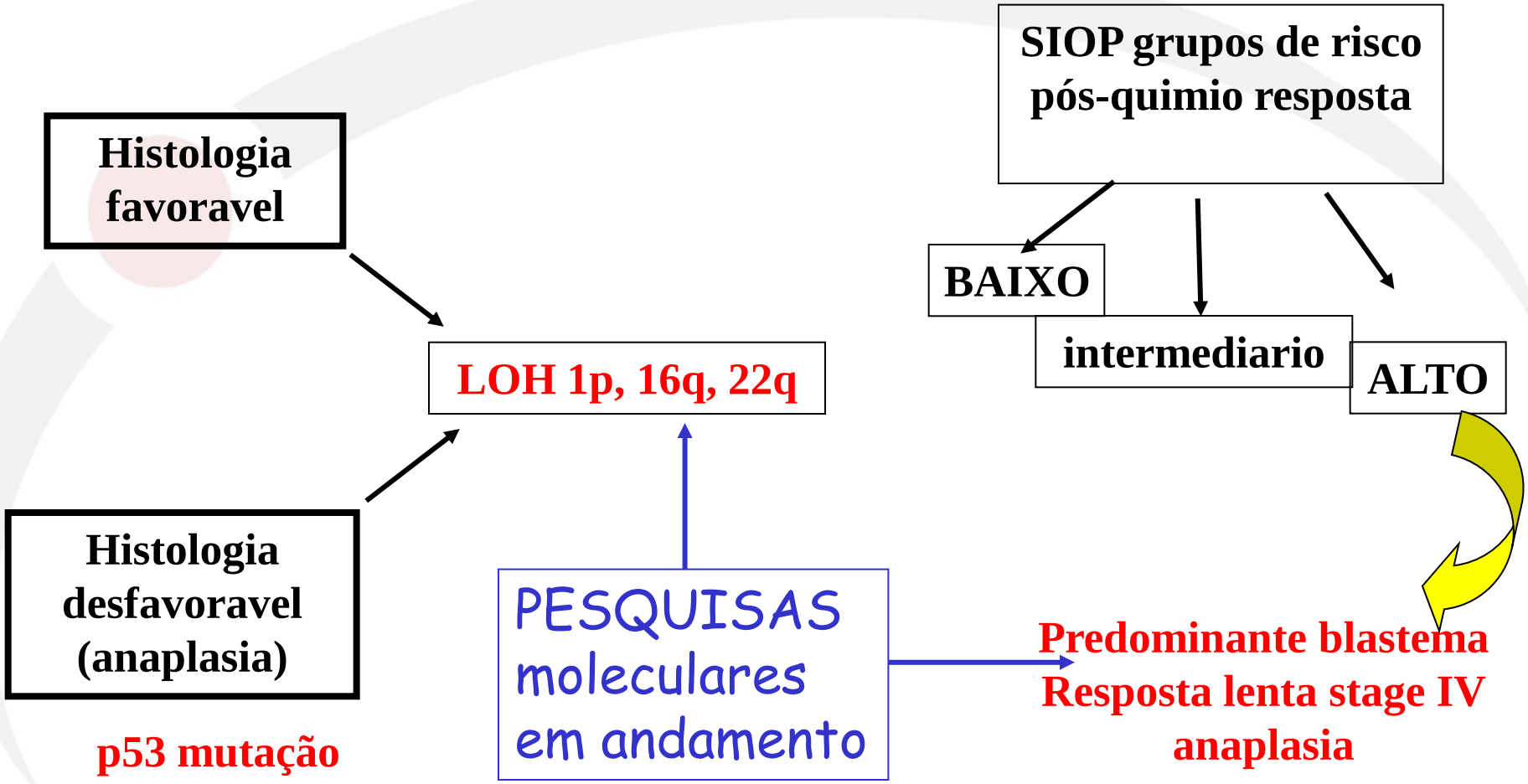
Tratamento TUMOR DE WILMS





NWTS-5	SG-4 anos	SIOP-9
87%	I-III	86%
69%	IV	65%

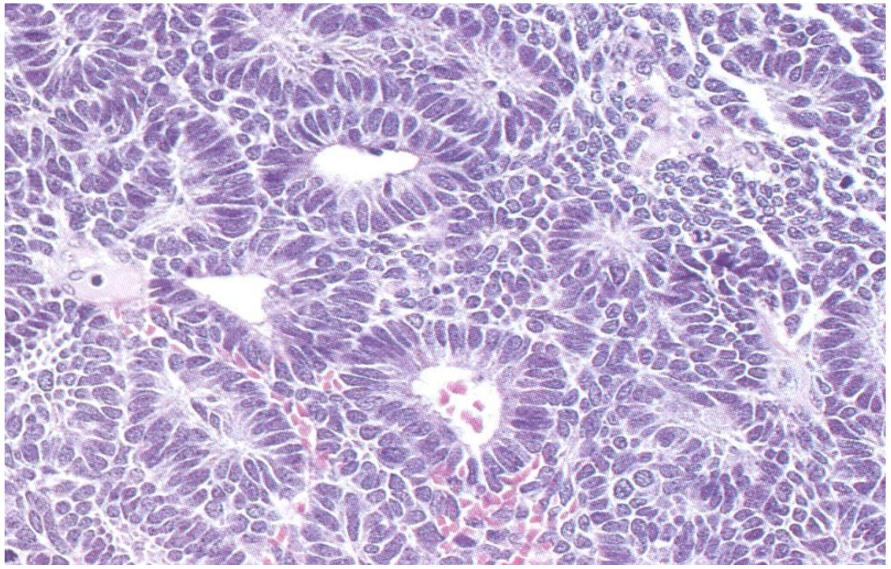
Med Pediatr Oncol 2003;41:545-549

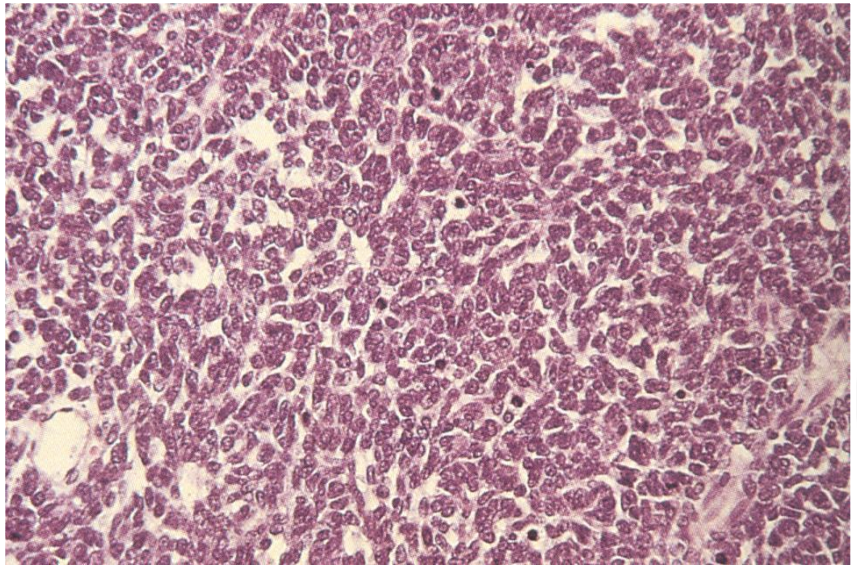

SIOP grupos de risco
pós-quimio resposta
Histologia
favoravel
BAIXO
intermediario
ALTO
LOH 1p, 16q, 22q
Histologia
desfavoravel
(anaplasia)
p53 mutação
PESQUISAS
moleculares
em andamento
Predominante blastema
Resposta lenta stage IV
anaplasia

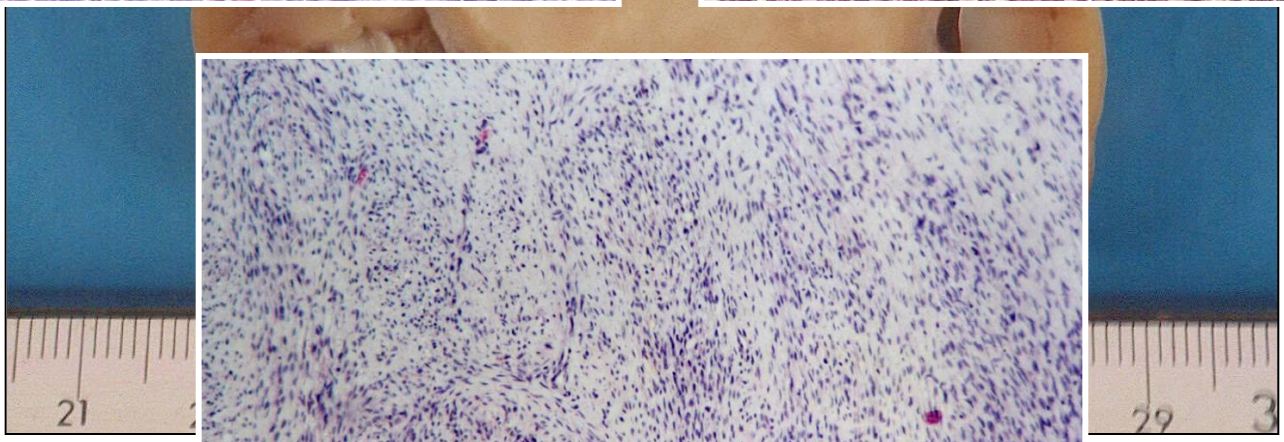
ESTÁDIO

HISTOLOGIA

MARCADORES MOLECULARES







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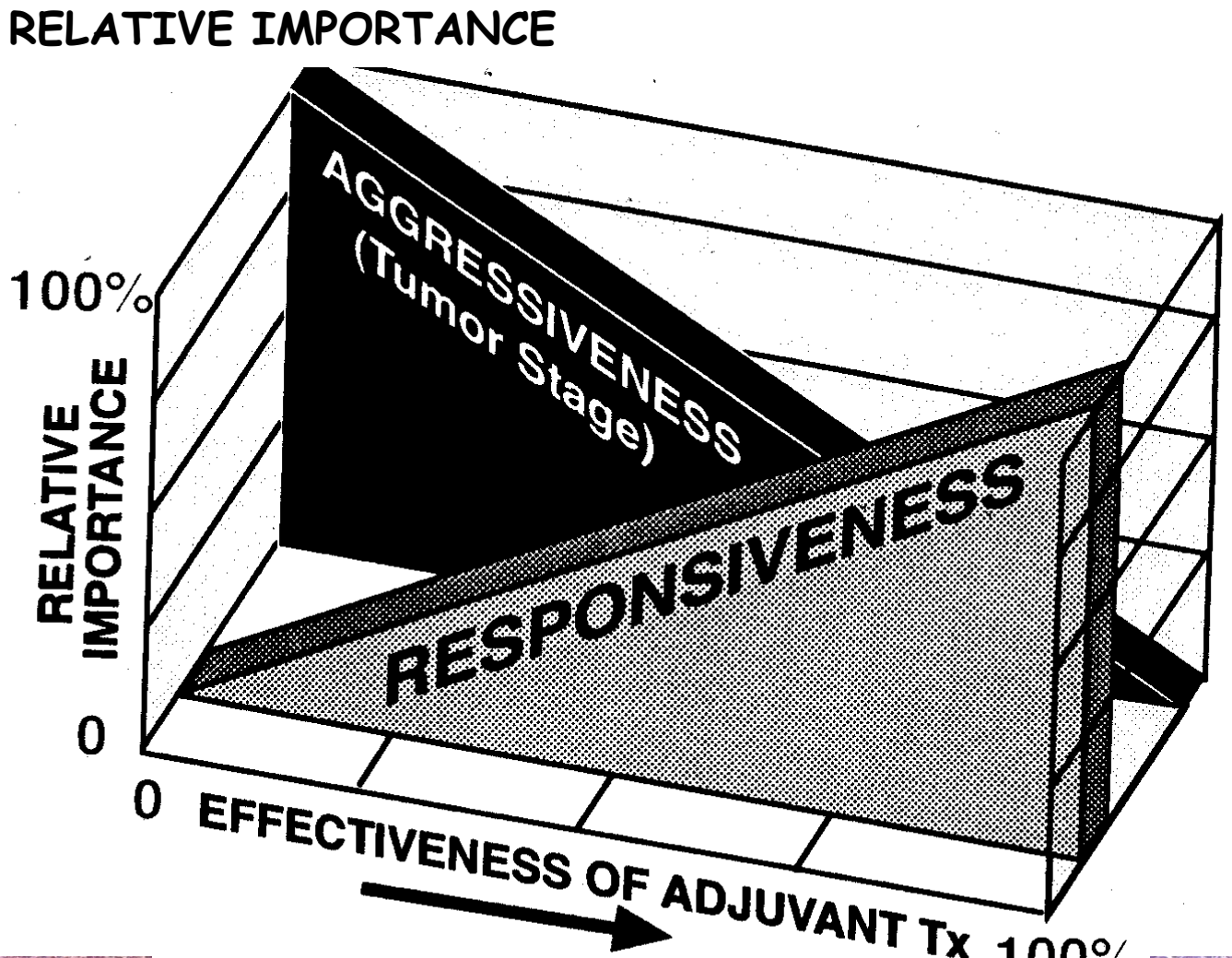
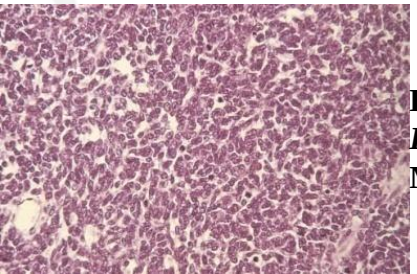
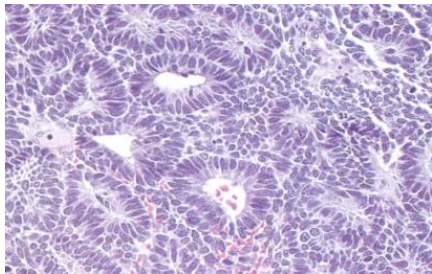
AGGRESSIVENESS vs. RESPONSIVENESS

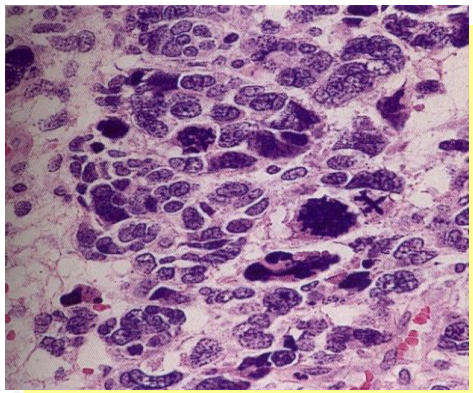




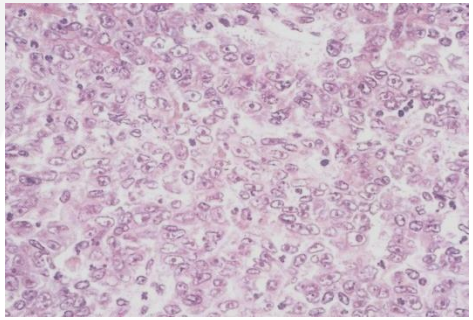
Beckwith JB, Zuppan CE, Browning NG, Moksness J, Breslow NE. *Histological analysis of aggressiveness and responsiveness in Wilms' tumor.* Med Pediatr Oncol. 1996 Nov;27(5):422-8.



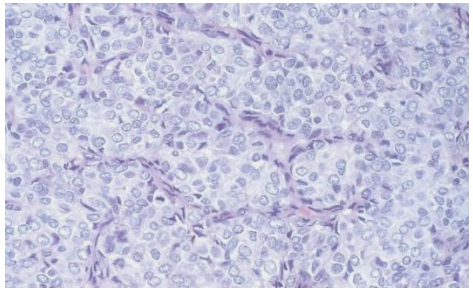
Histologia desfavorável



Anaplasia

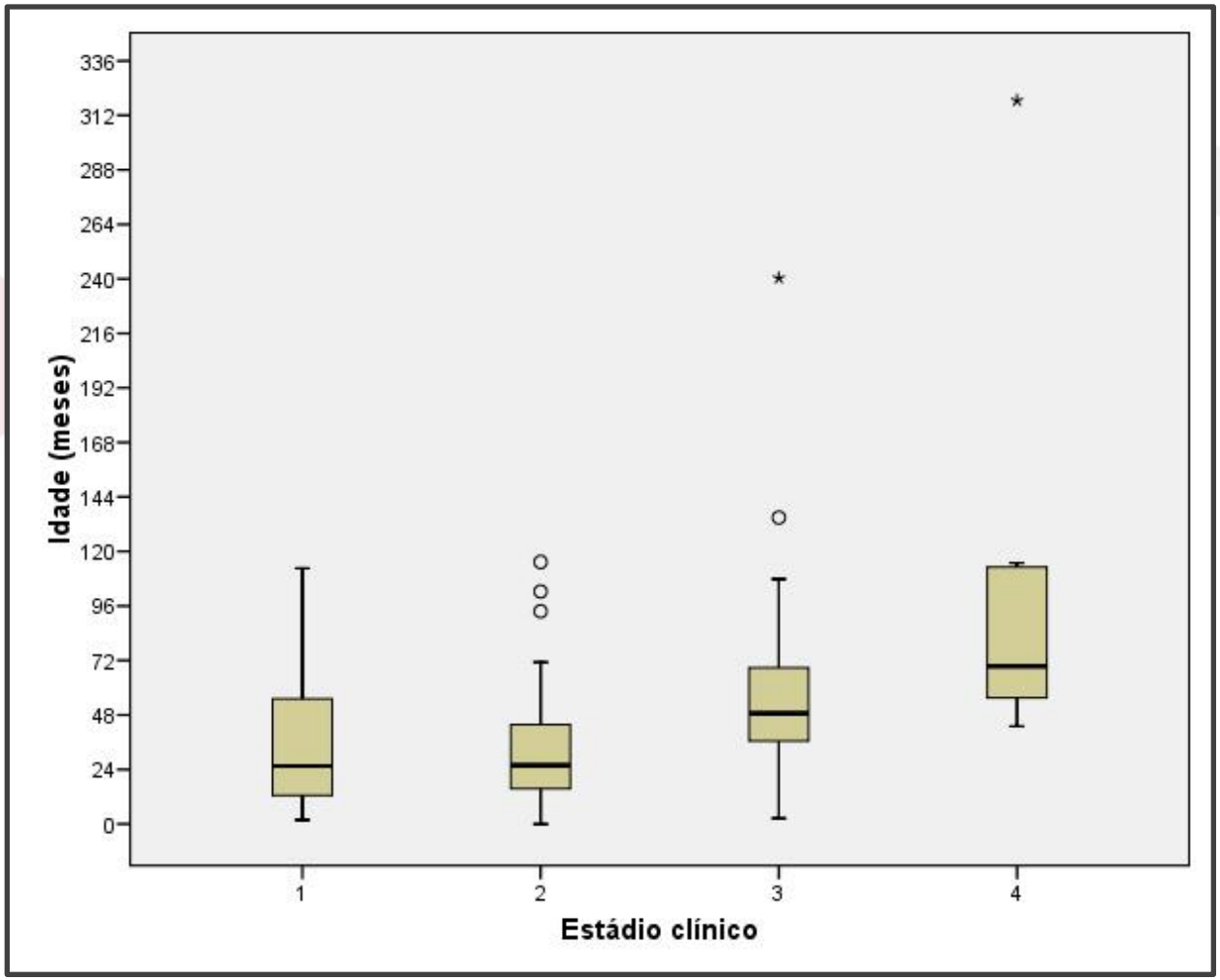


Tumor Rabdóide



Sarcoma células claras

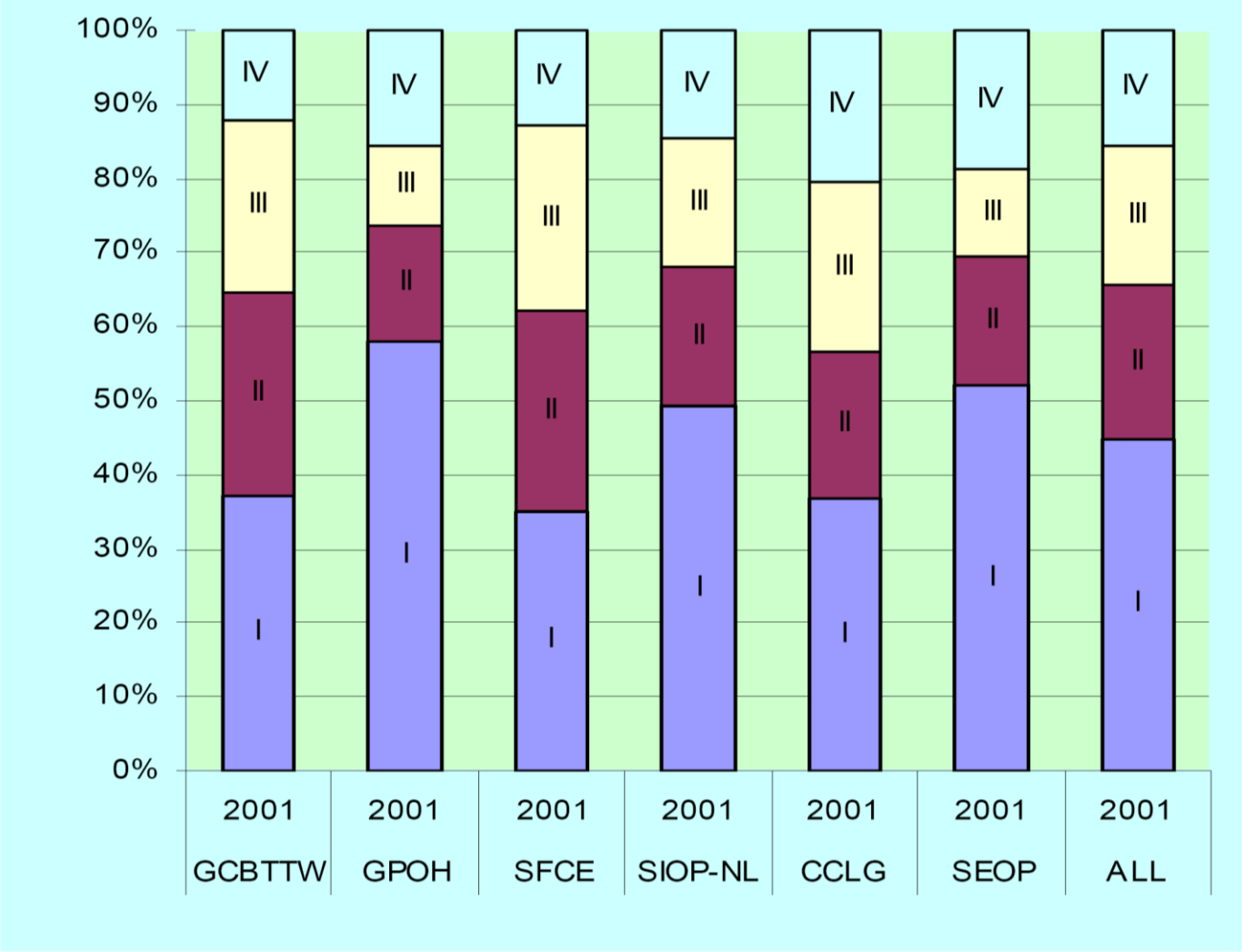
Correlação entre as médias da idade em meses dos pacientes com estadio clínico- 96 TW



Costa CM, de Camargo B , 2008

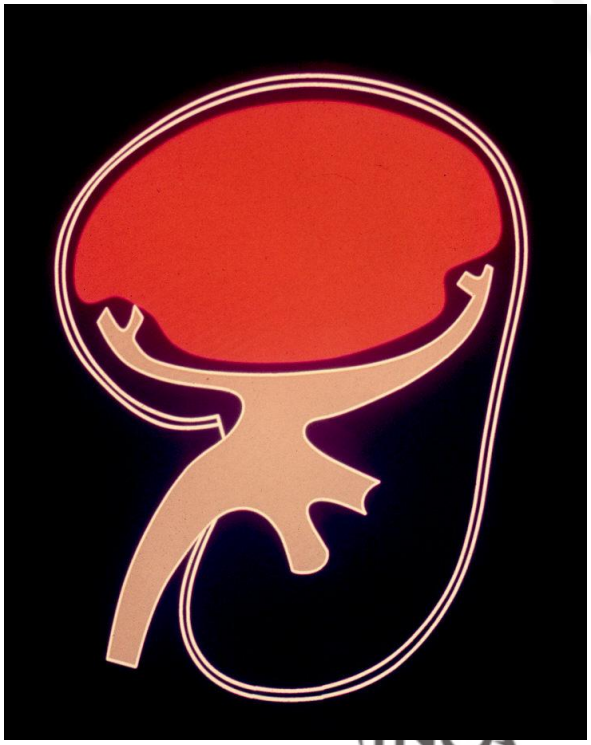
Wilms´Tumor- SIOP-2001

Figure 3. Stage localized and metastatic Wilms' tumors

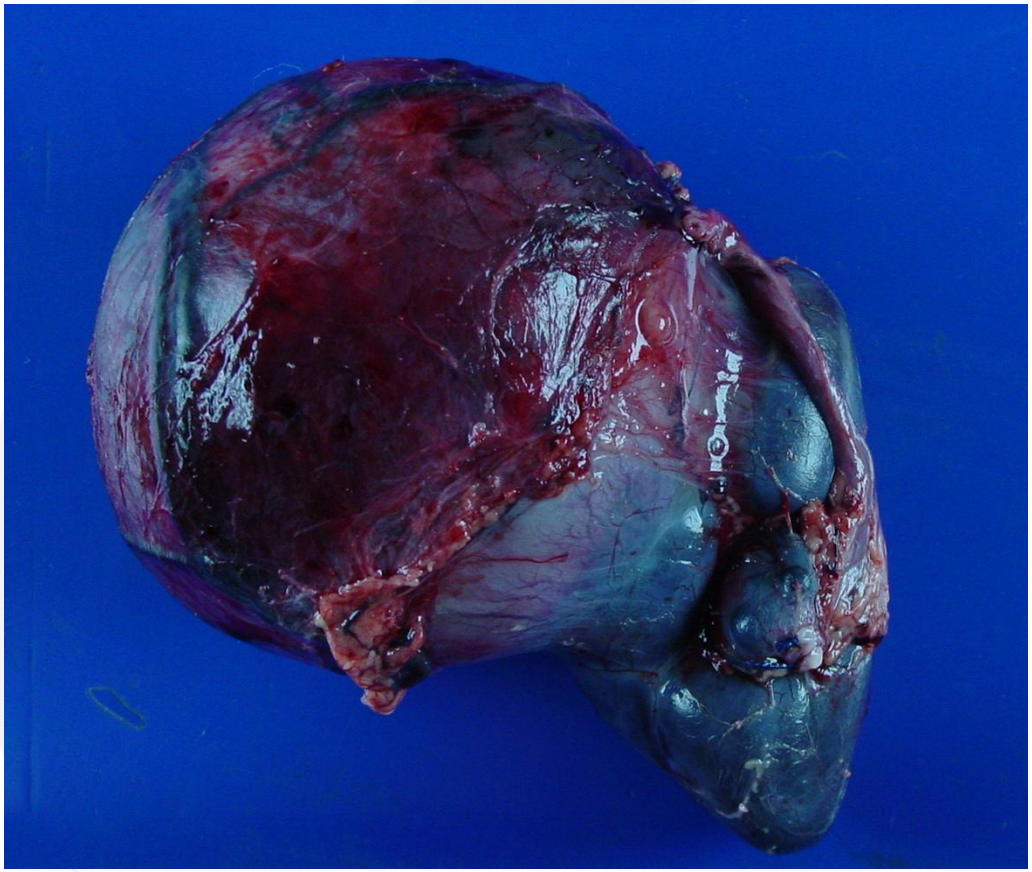


ESTÁDIO I

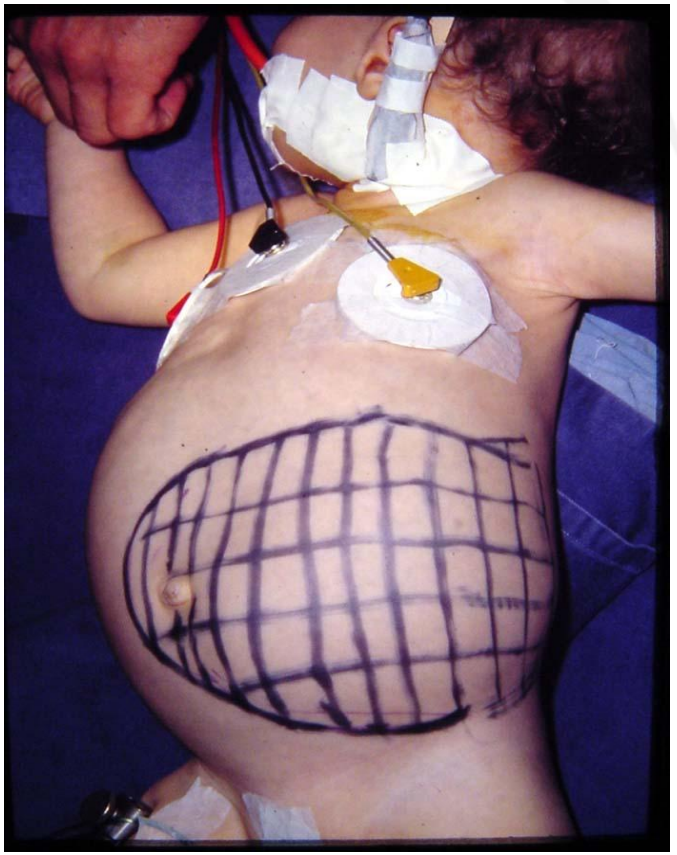
Confinado ao rim e completamente ressecado
Não há comprometimento na capsula renal capsule ou envolvimento do seio renal



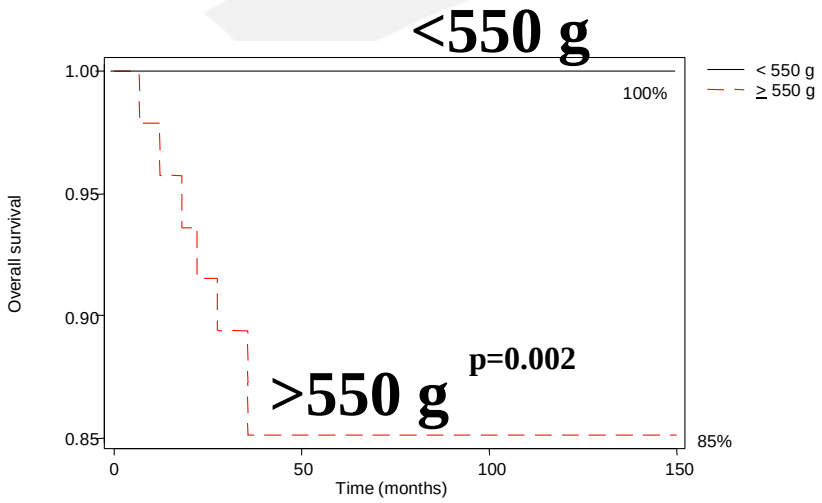
ESTÁDIO I

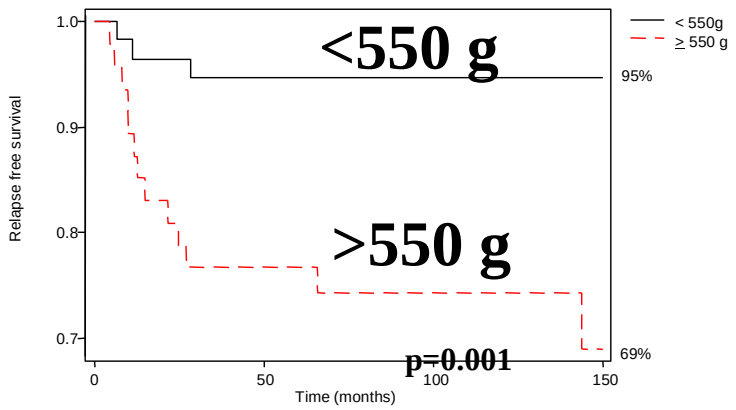


Peso Tumoral
Idade



Estadio I/II histologia favorável
104 pacientes





Sobrevida global

Sobrevida livre de recaída

ORIGINAL ARTICLE
Oncology

P-Glycoprotein Expression, Tumor Weight, Age, and Relapse in Patients with Stage I and II Favorable-Histology Wilms' Tumor

Roberto Augusto Plaza Teixeira, MD,[1] Vicente Odone-Filho, MD,[1] Beatriz de Camargo, MD,[2] Maria Claudia Zerbini, MD,[3] Renne Fillipi, MD,[3] Arlaine Alencar,[4] and Lilian Cristofani, MD[5]

Pediatric Hematology and Oncology, 28:194–202, 2011

ISSN: 0888-0018 print / 1521-0669 online
DOI: 10.3109/08880018.2010.533250

Estadio I- COG

- < 500 grs
- < 24 meses

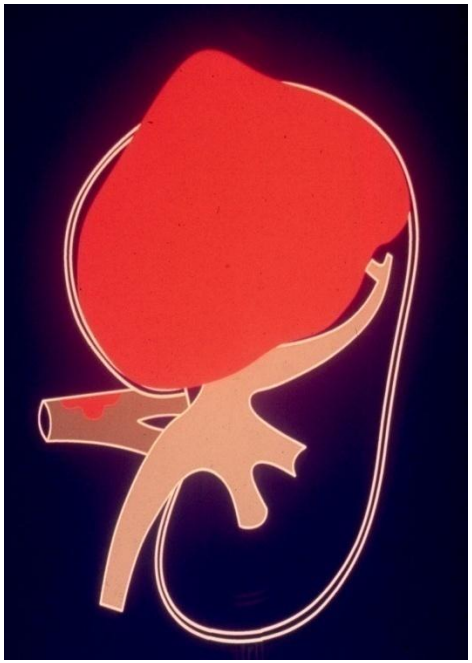
→ só cirurgia

15% recaída (Green D. et al. J Clin Oncol 2001)

ESTÁDIO II

Tumor completamente ressecado porem alem do rim (margens negativas)

Penetração da capsula renal
Invasão dos vasos renais/seio renal



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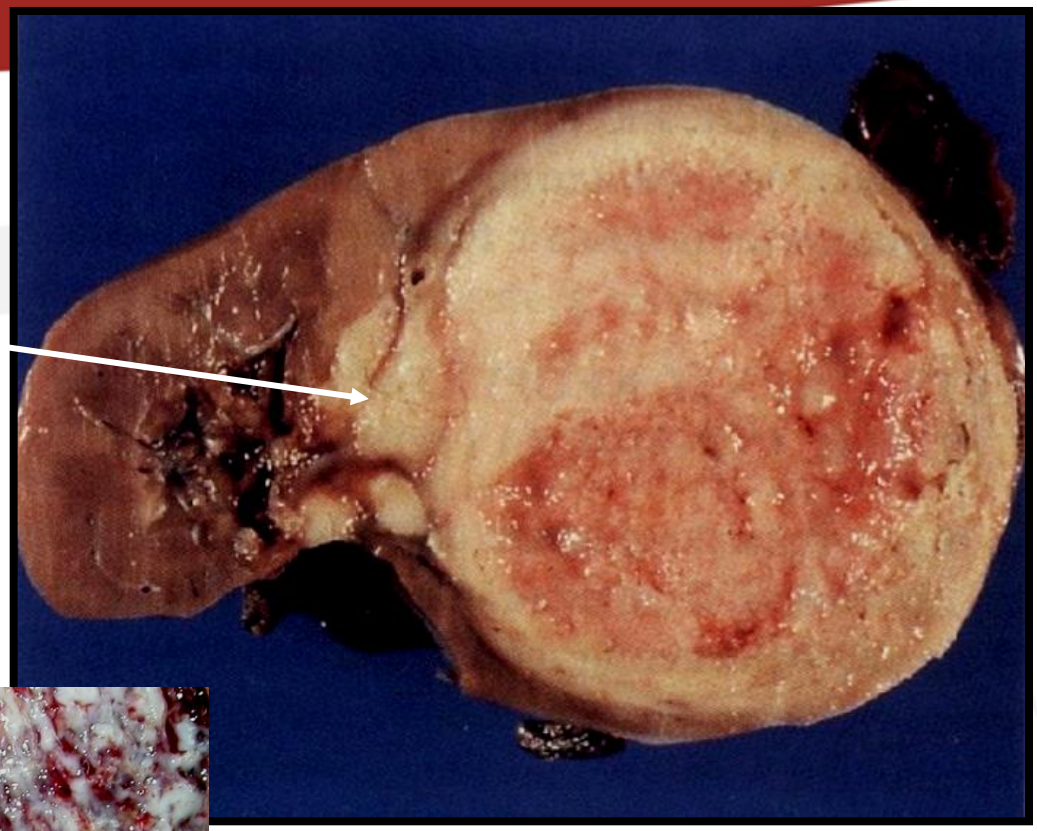
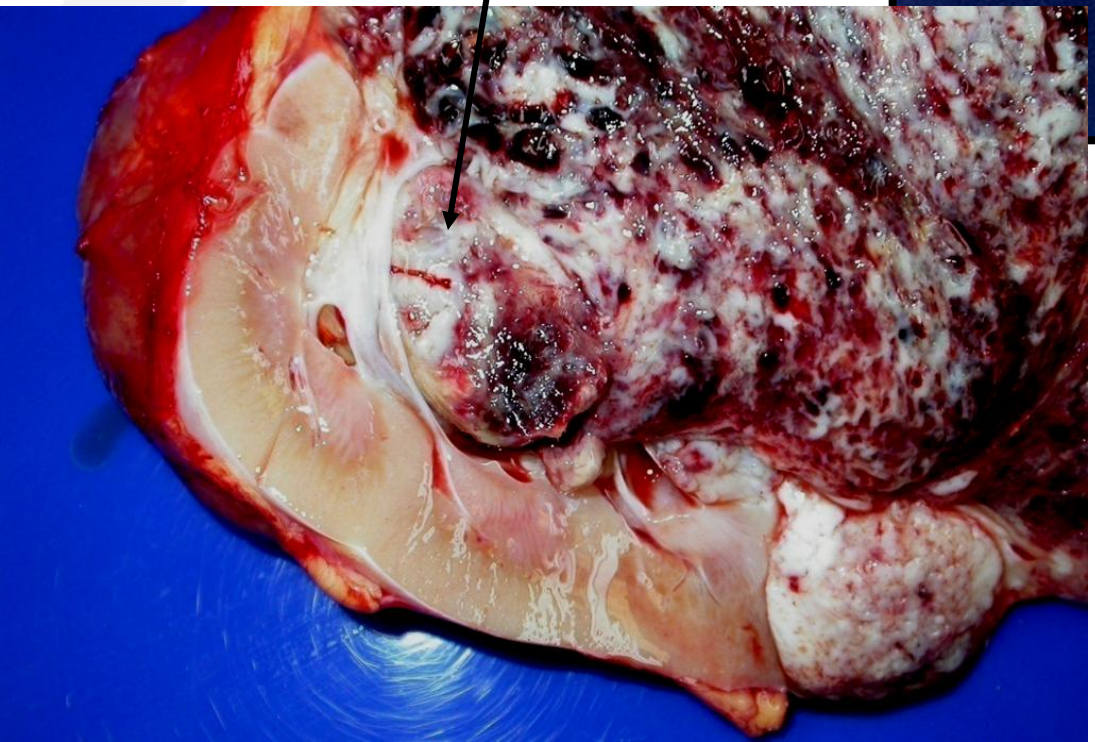
Invasão seio renal





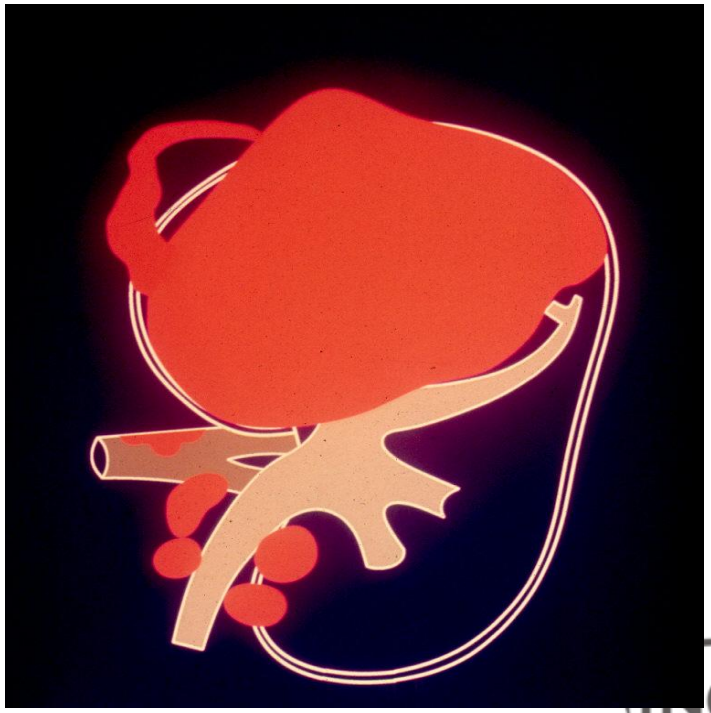
ESTÁDIO II

RUPTURA localizada no flanco (incluindo biopsia do tumor)

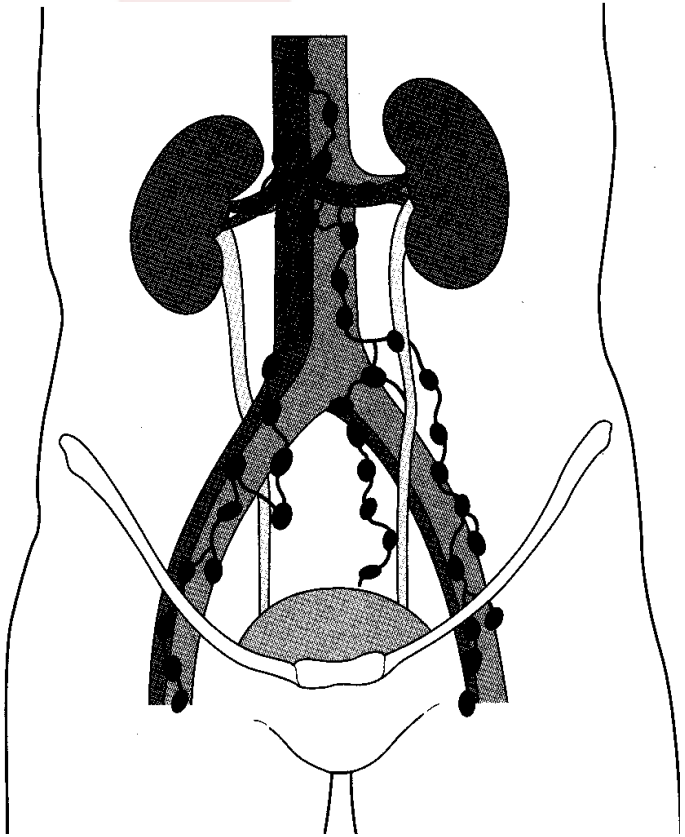
NÃO é mais considerado estádio II e sim III

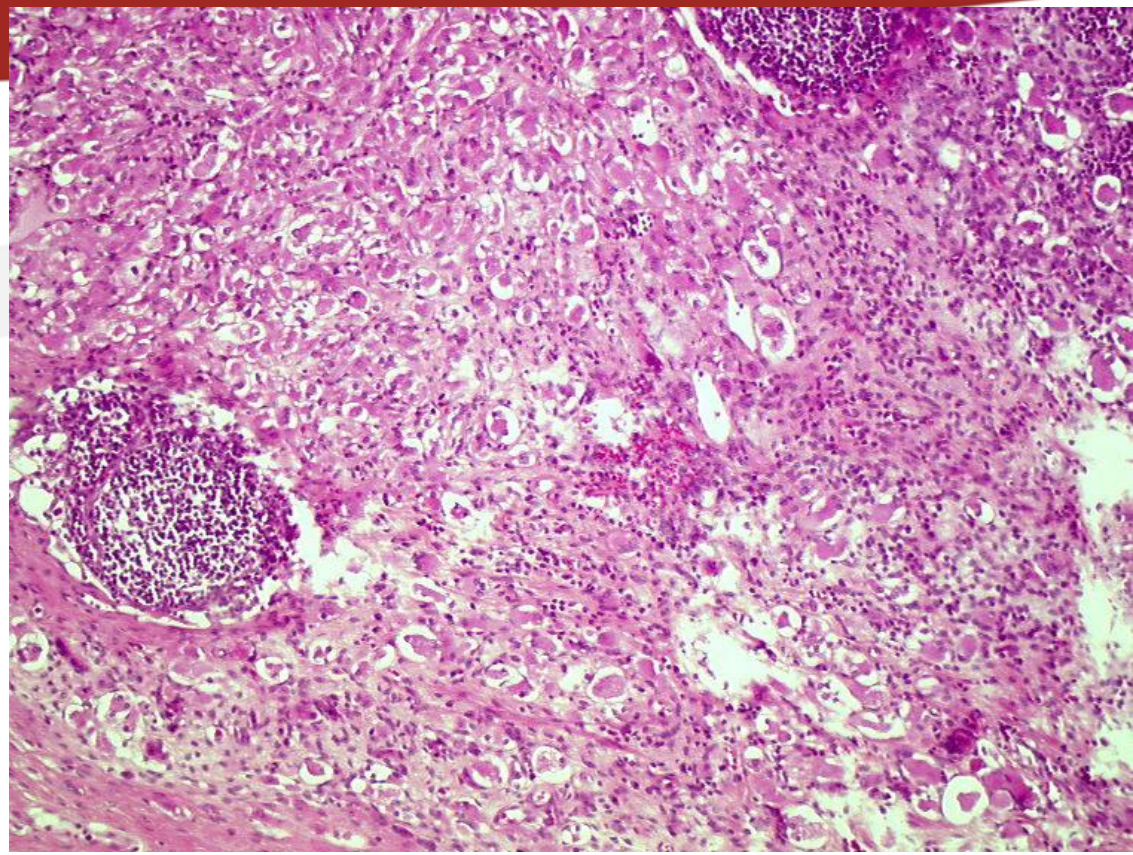
ESTÁDIO III

- ✓Tumor macroscopico residual
- ✓Linfonodos positivo
- ✓Ruptura Tumoral



Linfonodos positivos





ESTÁDIO III

SIOP:
estádio II linfonodos = estádio III

RECAÍDA LOCAL

LINFONODOS

Estádio I	RR	95%CI
Negativo	1.0	
Não examinado	6.0	(1.5-24)

(NWTS-4- 82 casos)

Shamberger R. et al. Annals of Surgery 229:292-297,1999

Linfonodos positivos

- ✓Biopsia é essencial !
- ✓Somente inspecção não é adequado
- ✓Estadio III: SLE : 73% vs. 98% (p=0.001)

Otherson HB et al. J Pediatr Surg 1990:25:330-331
Shamberg RC et al. Ann Surg 1999:229-297.
Ehrilch PF et al. J Pediatr Surg 2005:40:208-212.

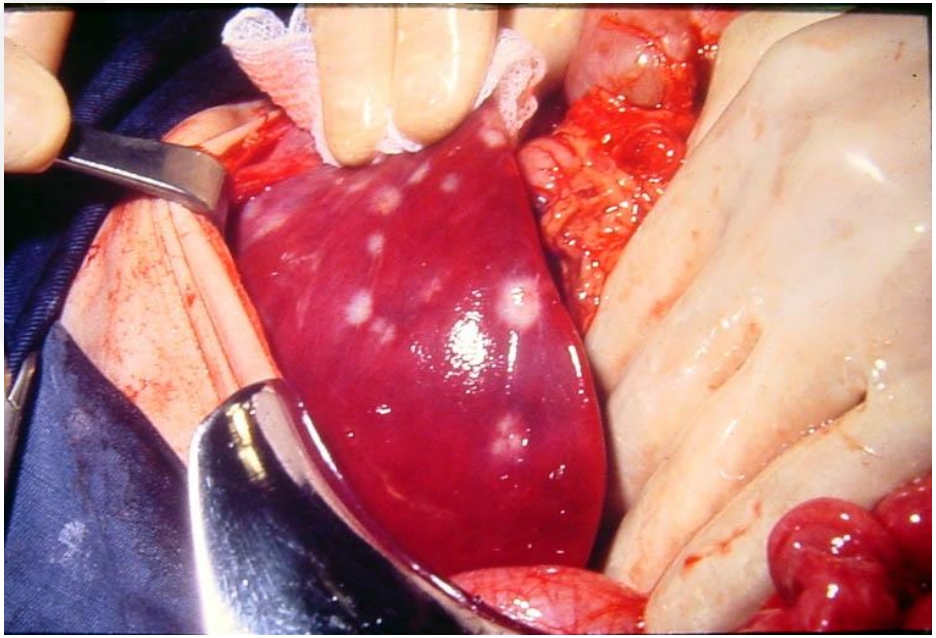
Implantes peritoneais

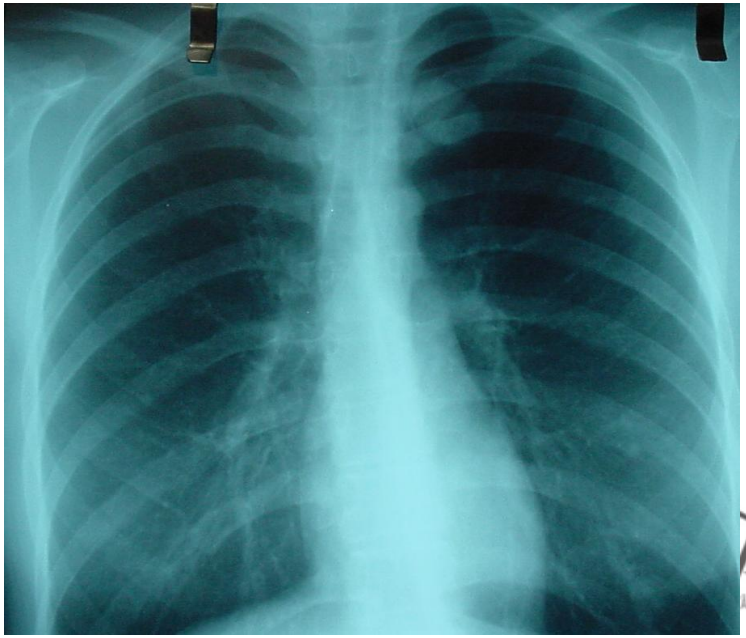
- ✓74% dos estádios III apresentam
- ✓84% cirurgia macroscópica
- ✓É necessario RXT abdomen total (+ 3 drogas)

Int J Radiol Oncol Bio Phys 2010:77:554-558.

ESTÁDIO IV

Metástases hematogenicas ou metástases linfonodos fora da abdomen (eg pulmão, fígado, osso, cerebro)





ESTÁDIO IV

SLE

Pulmão vs. fígado vs. pulmão+fígado vs. outros

76% vs. 76% vs. 70% vs. 64%

p= 0.060

Ann Surg 2009;250:642-8.

Reduzir morbidade ➡

- Cirurgia
- Quimioterapia
- Radioterapia

"Cure at least cost"

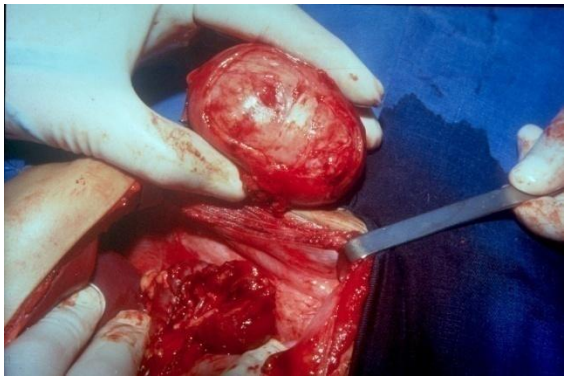
CIRURGIA

Laparoscopia

J Urol 2004;172:1438-40
BJU Int. 2006;98:155-9

Preservação do parênquima renal

J Pediatr Surg 1998;33:165-70
Pediatr Surg Int 2003;19:457-62



"Cure at least cost"

Radioterapia
Dose

Campo

Pulmão: SIOP-2001

Treatment of childhood Wilms' tumor without radiotherapy in Nicaragua

F. Baez[1]*, F. Fossati Bellani[2], E. Ocampo[1], V. Conter[3], A. Flores[1], T. Gutierrez[1], A. Malta[1], G. Mendez[1], C. Pacheco[1], R. Palacios[1], A. Sala[3], S. Galimberti[3], F. Cavalli[4] & G. Masera[3]

Annals of Oncology 13:944,2002

"cure at any cost"

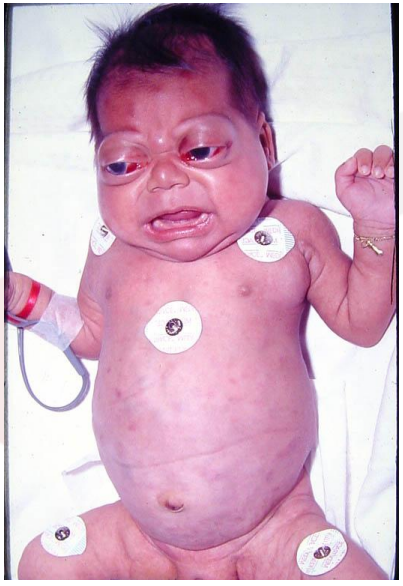
- Identificar fatores prognósticos

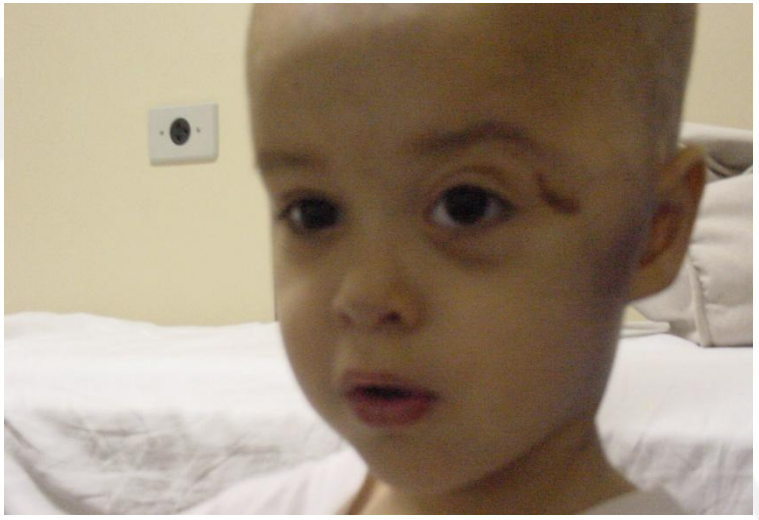
Marcadores moleculares

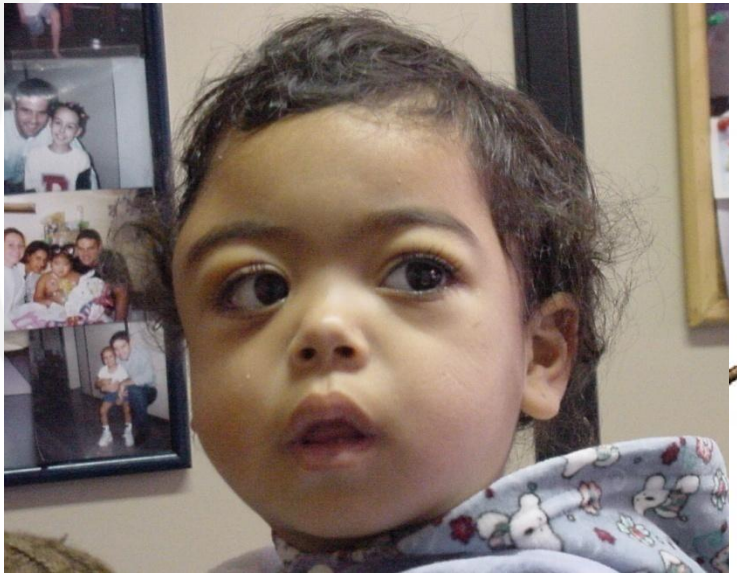
- INTENSIFICAR tratamento

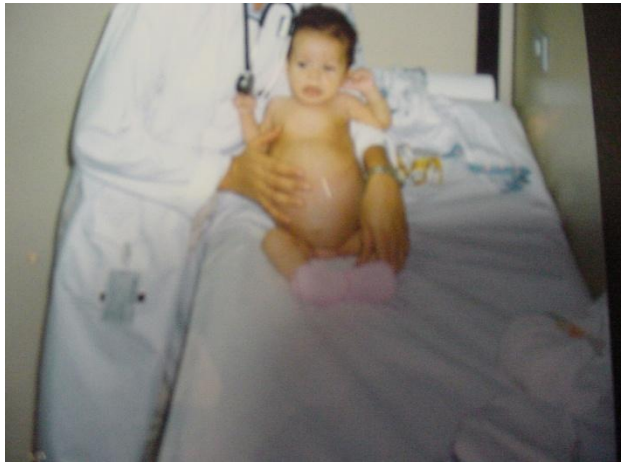
VP-16, carboplatina, ifosfamida,ciclofosfamida

Neuroblastoma









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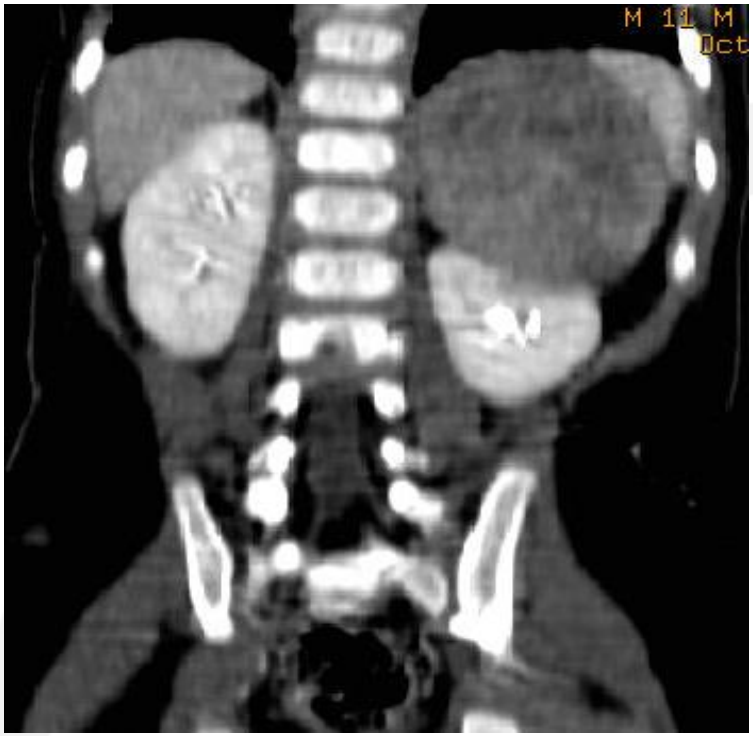
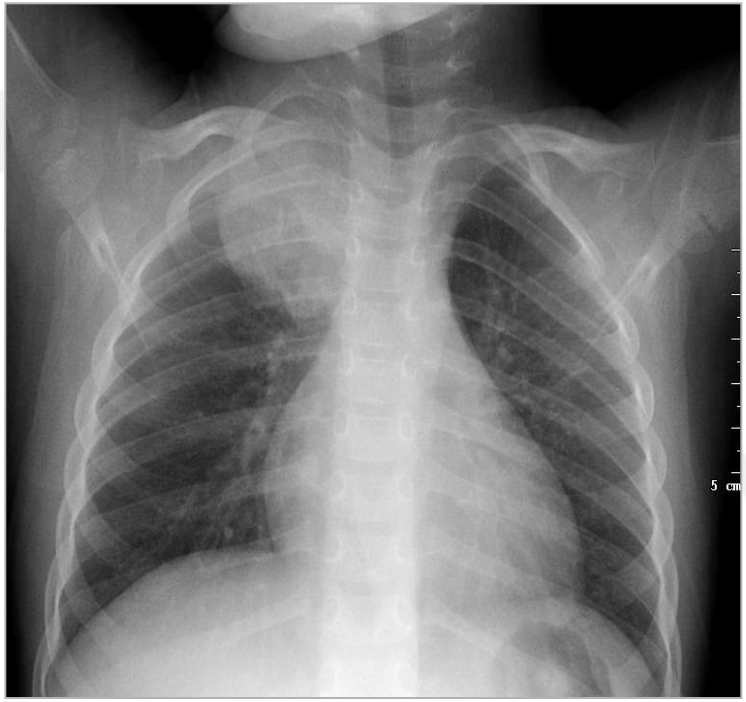
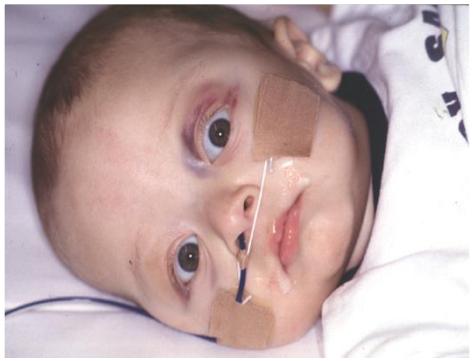
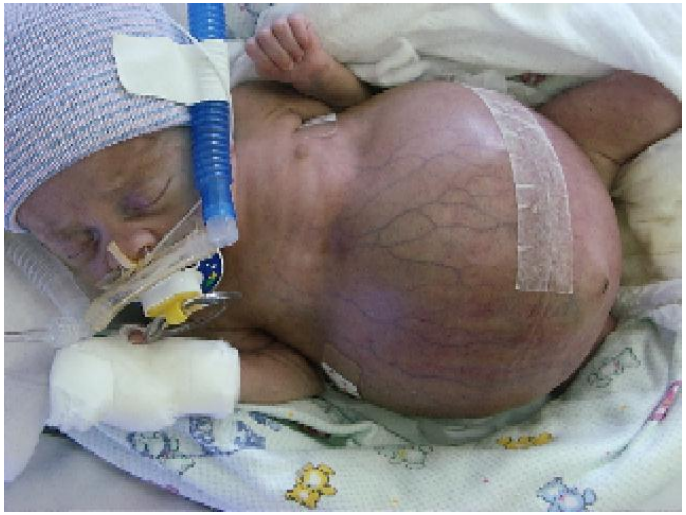
Neuroblastoma

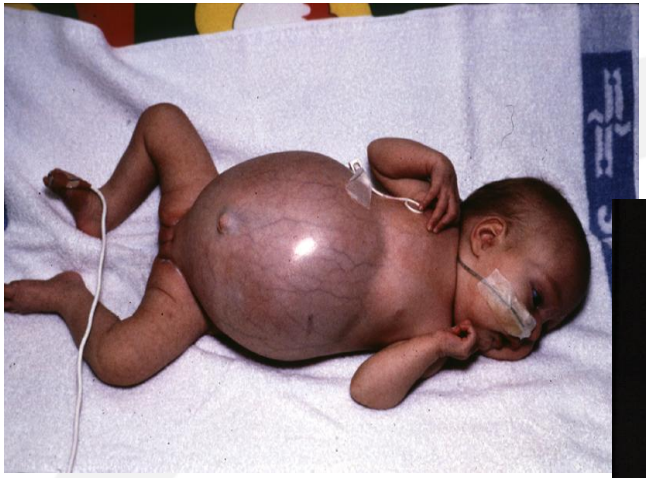


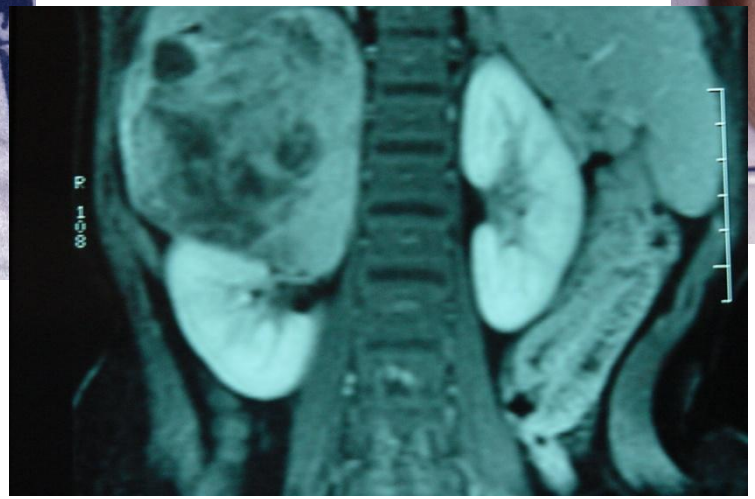


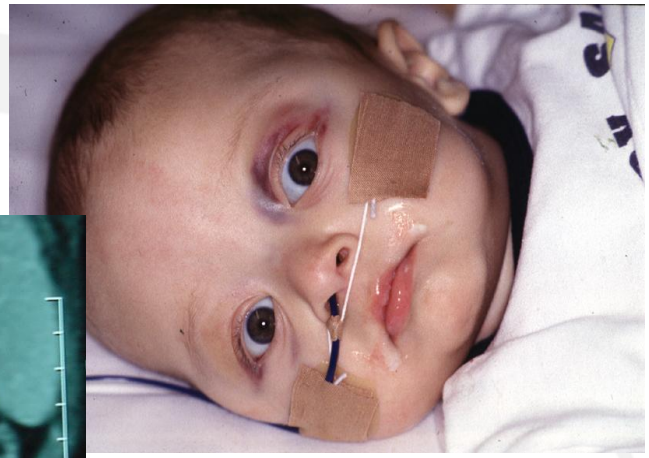




Neuroblastoma

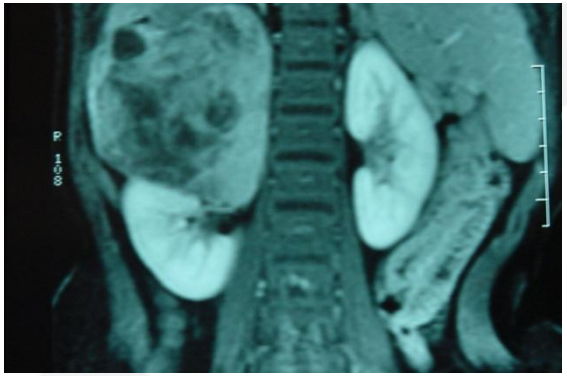




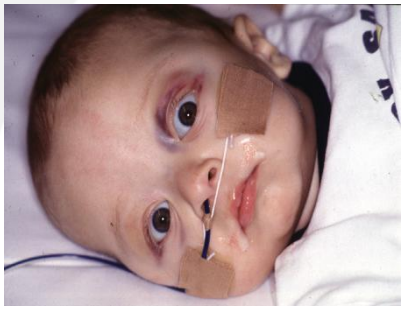


QUADRO CLINICO

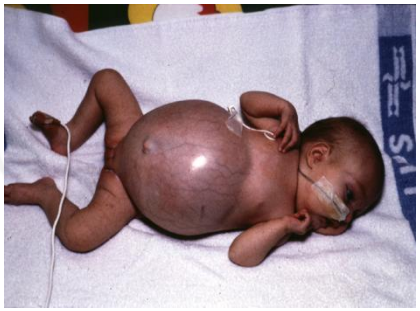
Neuroblastoma



Localizado:> 85% (cirurgia)



Estadio 4:25-30%
(QT/RXT/Cirurgia/TMO)



Estadio 4s: > 85% (tto minimo)

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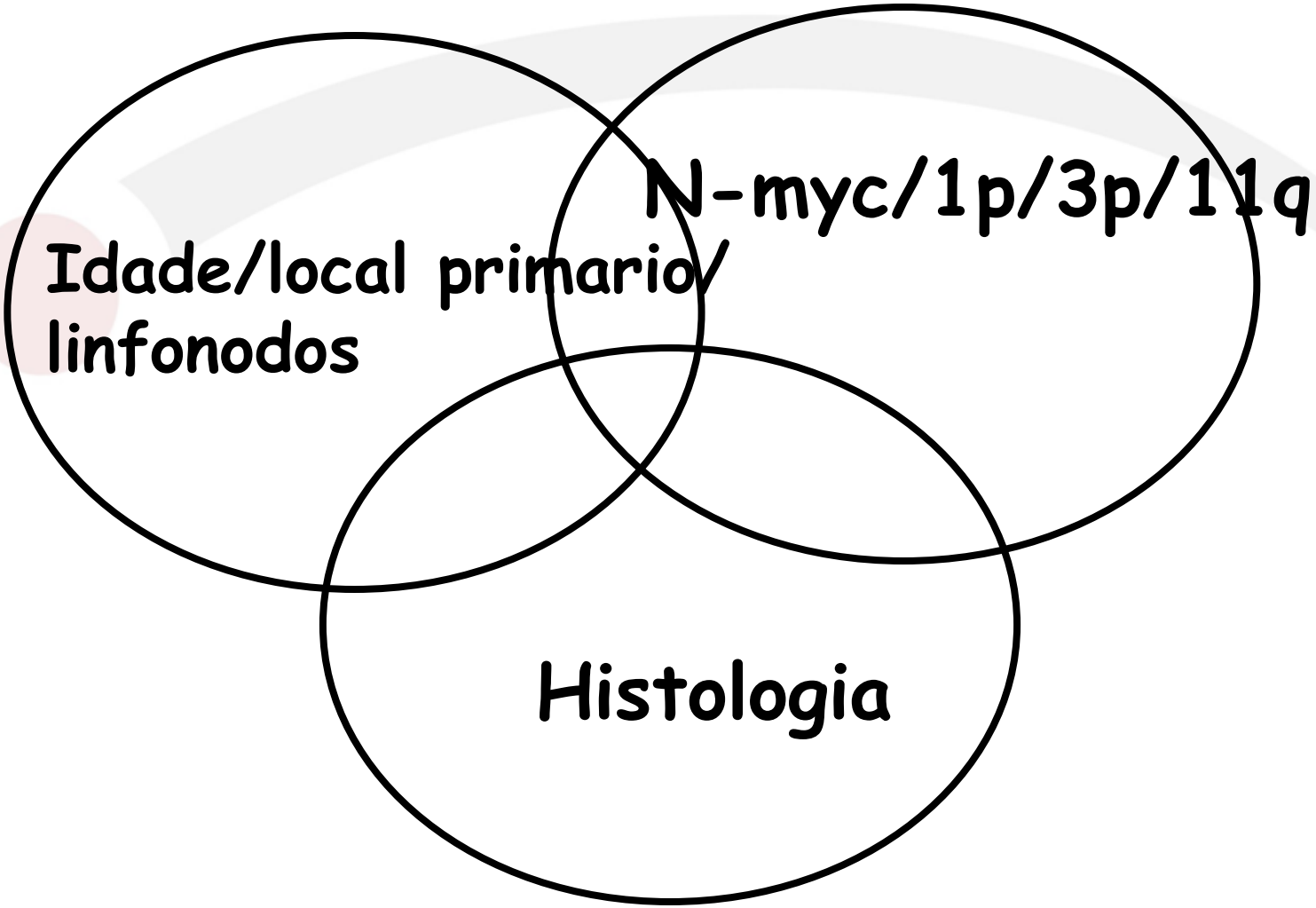
Fatores prognósticos

- ✓Idade
- ✓Biologicos
- ✓Histopatologicos
- ✓Tumor (tamanho, localização)

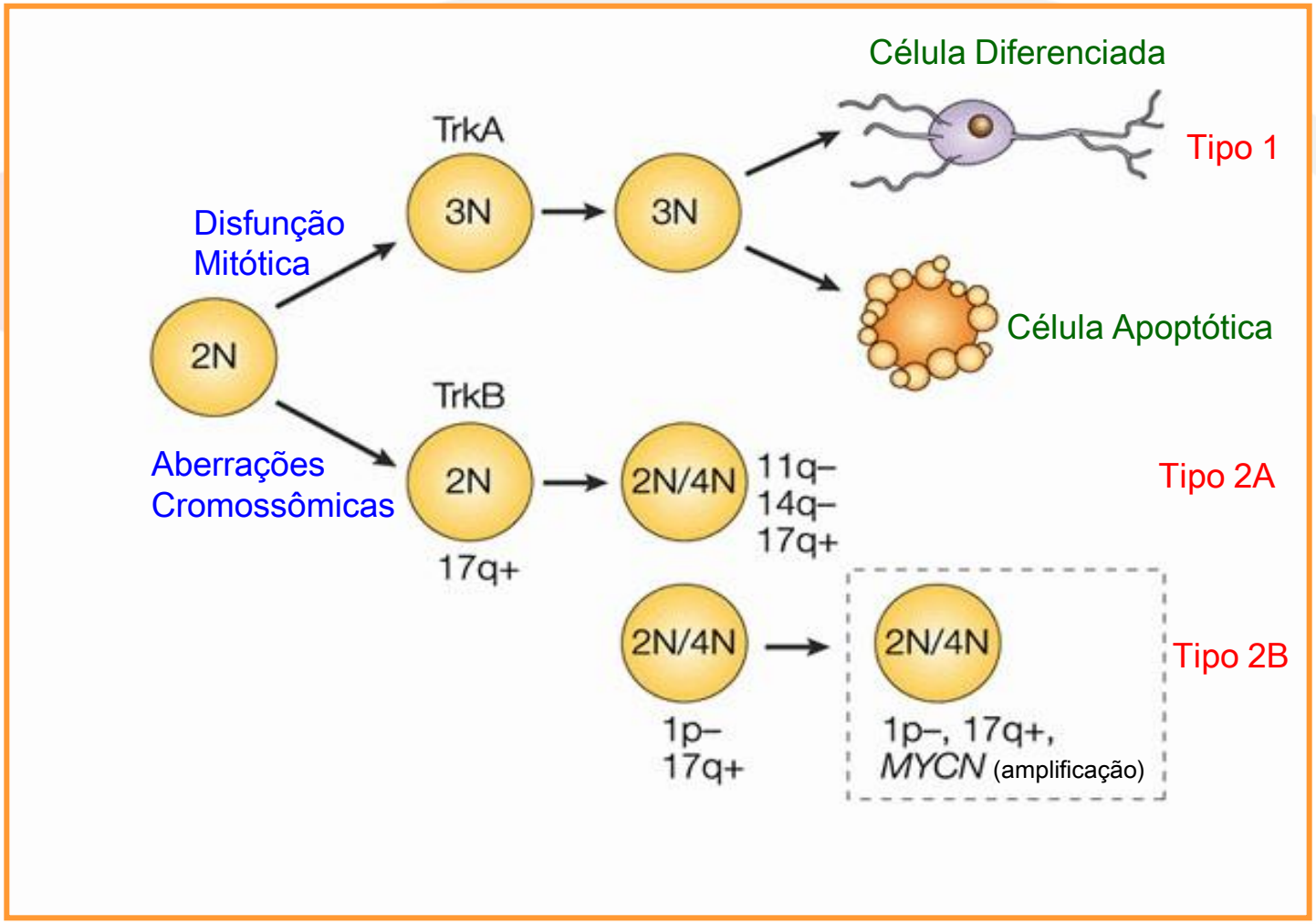
Neuroblastoma localizado

Fatores prognósticos

- ✓Biologicos → ferritina
  DHL
  n-myc
  1p
  17q
  3p
  11q
  ploidia DNA

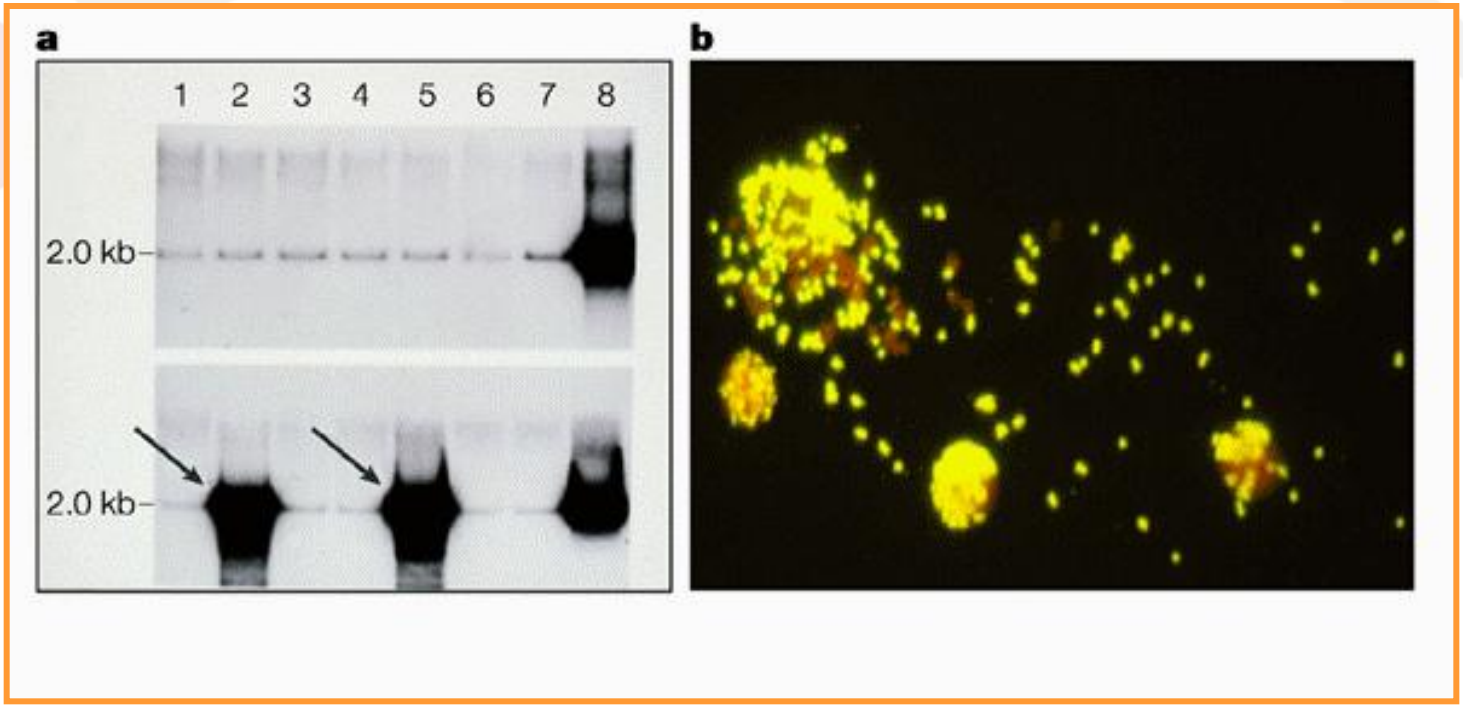

N-myc/1p/3p/11q
Idade/local primario/
linfonodos
Histologia

Marcadores Prognósticos em neuroblastomas



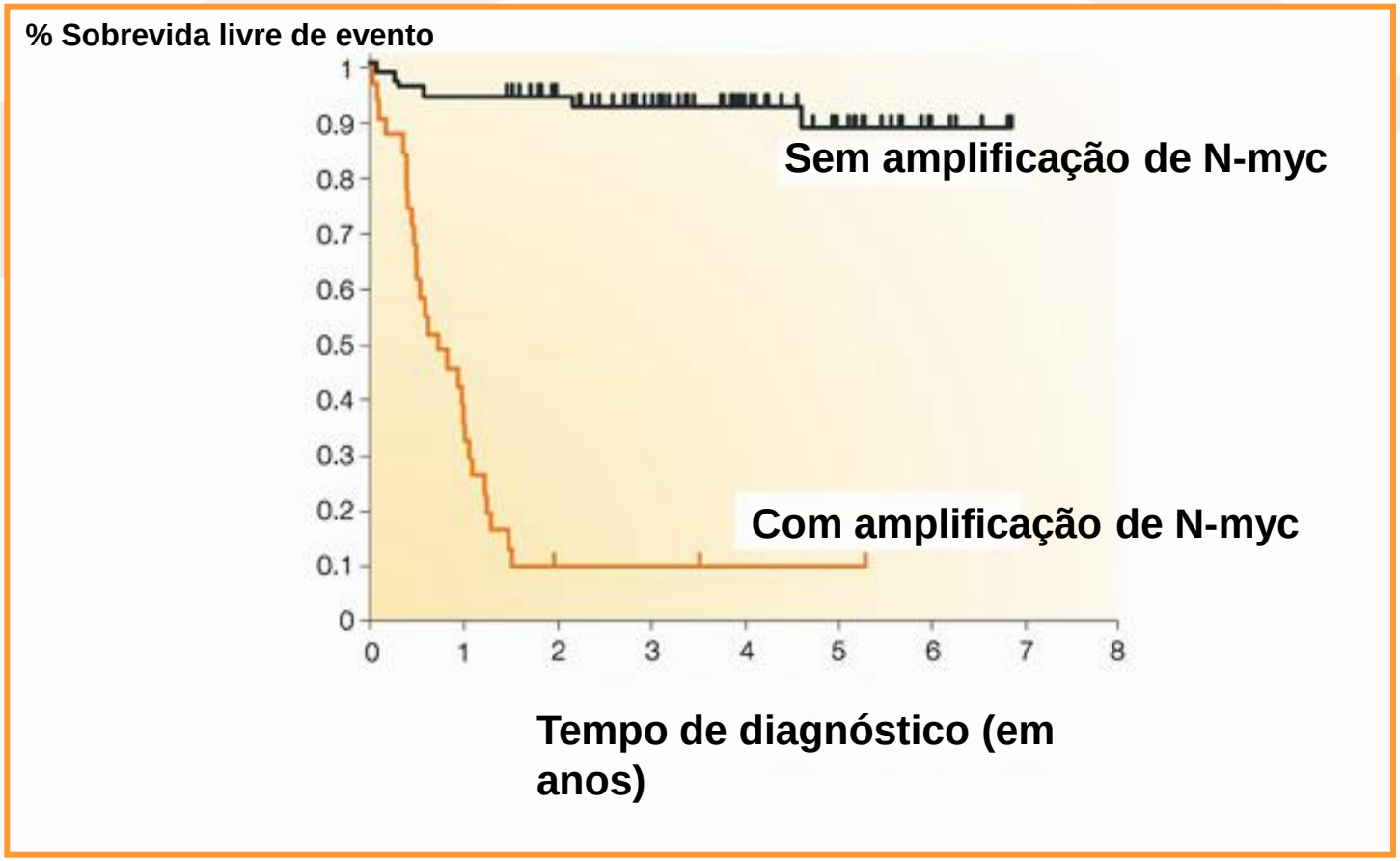
Brodeur GM. Nature Reviews - Cancer; 2003;3:203-16

Amplificação do N-myc em neuroblastomas



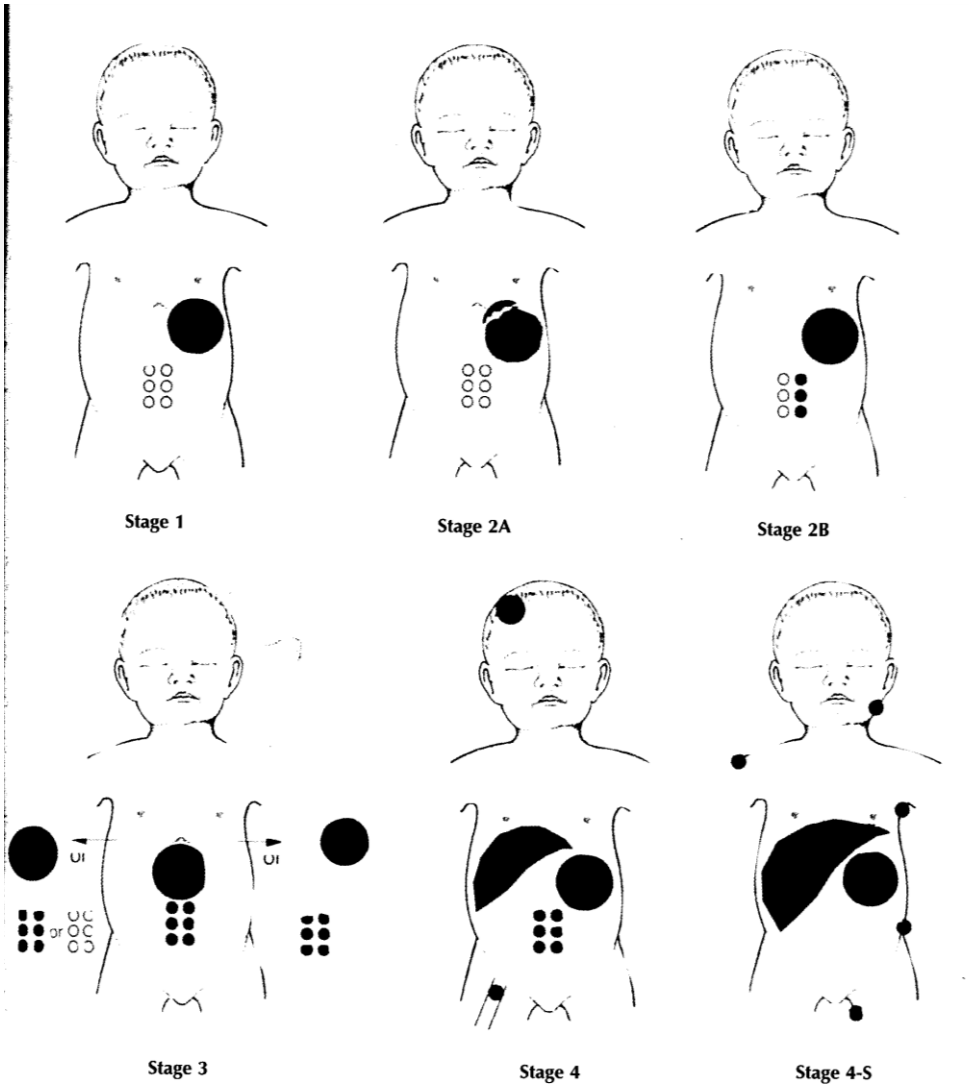
Brodeur GM. Nature Reviews - Cancer; 2003;3:203-16

Amplificação do N-myc em neuroblastomas



Brodeur GM. Nature Reviews - Cancer; 2003;3:203-16

Estadiamento Neuroblastoma



International Staging System of classification

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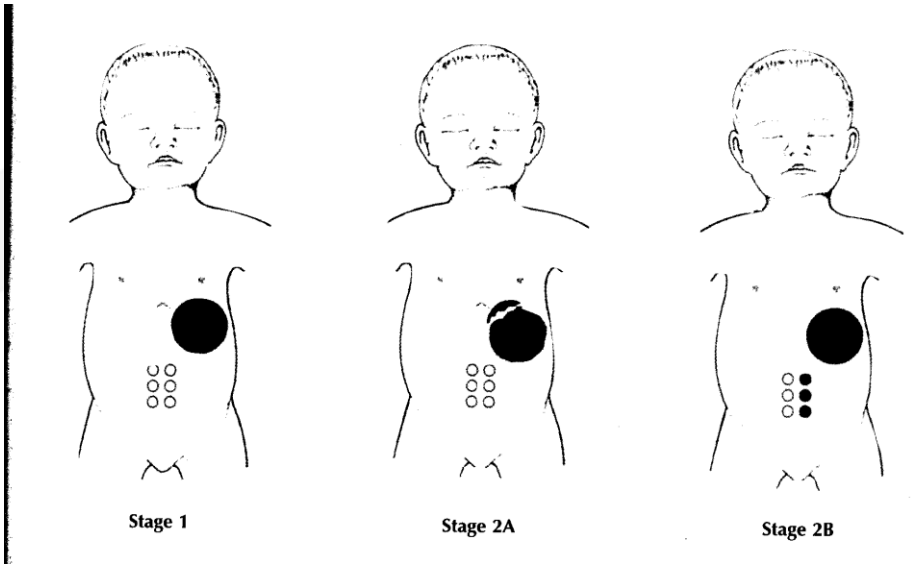
Estadiamento Neuroblastoma



Tumor local comple/ressecado
+ou-doença micro residual
Linf ipsilateral negativo
Linf aderidos

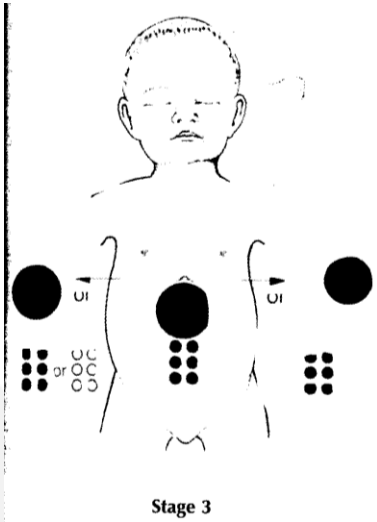
Tumor local resseção incomp
Linf ipsilateral negativo

Tumor local +ou- resseção comple
Linf ipsilateral positivo
Linf contralateral negativo

International Staging System of classification

INCA INSTITUTO NACIONAL DE CÂNCER

Estadiamento Neuroblastoma



Estadio 3

Tumor unilateral irressecavel infiltrando atraves da linha média com ou sem linfonodos comprometidos

Tumor unilateral com linfonodos contralateral positivos

Tumor da linha média irressecavel

International Staging System of classification

VOLUME 27 · NUMBER 2 · JANUARY 10 2009

JOURNAL OF CLINICAL ONCOLOGY

SPECIAL ARTICLE

From the Section for Paediatric Surgery, Division of Surgery, Rikshospitalet University Hospital, Oslo, Norway; Division of Oncology, Children's Hospital of Philadelphia, Philadelphia, PA; Children's Cancer Research Institute, St Anna Kinderkrebsforschung, Vienna, Austria; Department of Radiology, Institut Curie, Paris, France; Pediatric Surgery-Department of Pediatrics, University of Padova, Padova, Italy; Depart-

The International Neuroblastoma Risk Group (INRG) Staging System: An INRG Task Force Report

Tom Monclair, Garrett M. Brodeur, Peter F. Ambros, Hervé J. Brisse, Giovanni Cecchetto, Keith Holmes, Michio Kaneko, Wendy B. London, Katherine K. Matthay, Jed G. Nuchtern, Dietrich von Schweinitz, Thorsten Simon, Susan L. Cohn, and Andrew D.J. Pearson

Table 2. International Neuroblastoma Risk Group Staging System

Stage	Description
L1	Localized tumor not involving vital structures as defined by the list of image-defined risk factors and confined to one body compartment
L2	Locoregional tumor with presence of one or more image-defined risk factors
M	Distant metastatic disease (except stage MS)
MS	Metastatic disease in children younger than 18 months with metastases confined to skin, liver, and/or bone marrow

NOTE. See text for detailed criteria. Patients with multifocal primary tumors should be staged according to the greatest extent of disease as defined in the table.

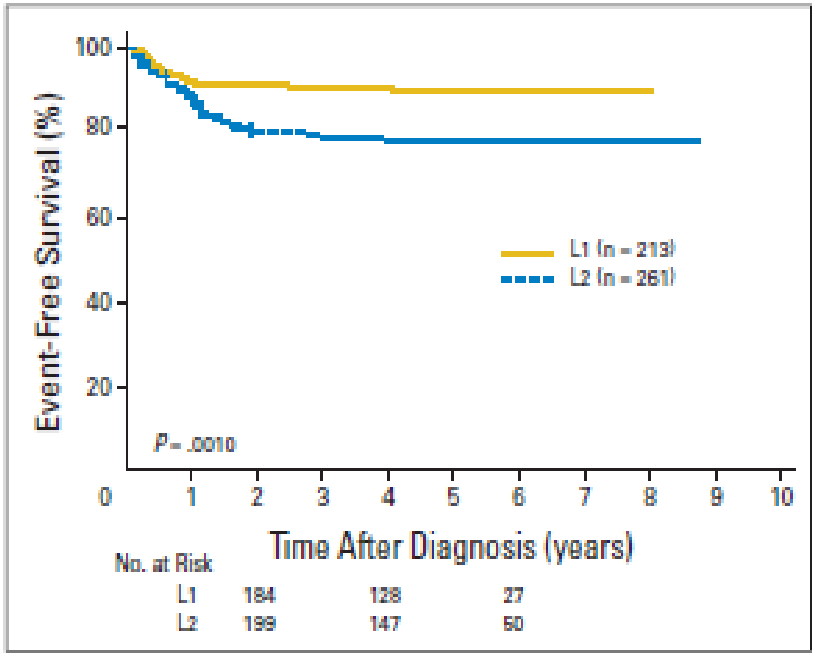


Fig 1. Event-free survival curves for International Society of Pediatric Oncology Europe Neuroblastoma Group patients by International Neuroblastoma Risk Group Staging System stage L1 versus L2 ($P = .0010$; n = 474). The number of patients at risk for an event are shown along the curves at years 2, 4, and 6.

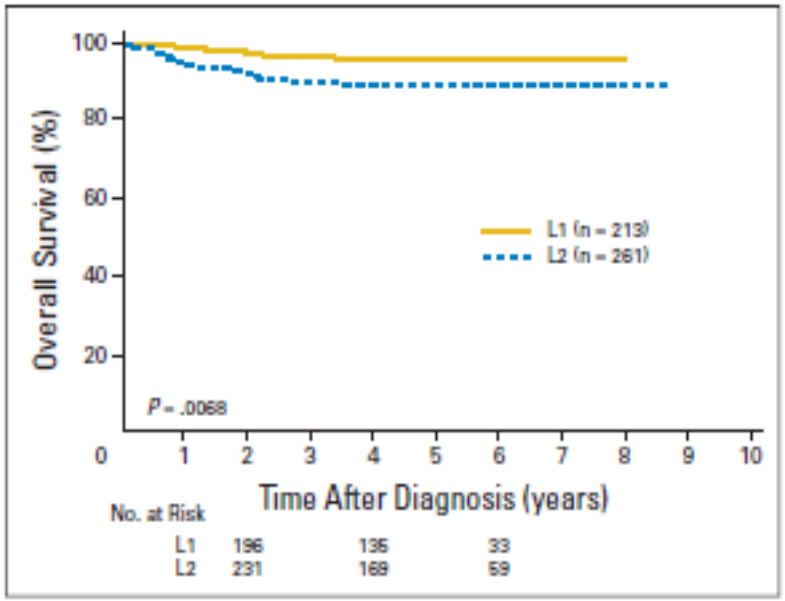


Fig 2. Overall survival curves for International Society of Pediatric Oncology Europe Neuroblastoma Group patients by International Neuroblastoma Risk Group Staging System stage L1 versus L2 ($P = .0068$; n = 474). The number of patients at risk for death are shown along the curves at years 2, 4, and 6.

The International Neuroblastoma Pathology Classification (the Shimada System)

Cancer 1999; 86:364-72

TABLE 4
Prognostic Effects by Grouping

Prognostic grouping	Survival[a]	*P* value
Shimada classification (consensus[b] 90%)		
Favorable histology (N = 103)	85%	$P = 0.31 \times 10^{-9}$
Unfavorable histology (N = 93)	41%	
Histologic grade (consensus[b] 73%)		
Grade 1 (a) (N = 62)	84%	(a) vs. (b), $P = 0.12$
Grade 2 (b) (N = 57)	73%	(a) vs. (c), $P = 0.0088$
Grade 3 (c) (N = 20)	58%	(b) vs. (c), $P = 0.18$
Risk group (consensus[b] 73%)		
Low risk (N = 85)	85%	$P = 0.41 \times 10^{-3}$
High risk (N = 54)	59%	
Histologic grade, modified (consensus[b] 90%)		
Grade 1 (a) (N = 85)	78%	(a) vs. (b), $P = 0.36$
Grade 2 (b) (N = 63)	70%	(a) vs. (c), $P = 0.39 \times 10^{-6}$
Grade 3 (c) (N = 23)	18%	(b) vs. (c), $P = 0.13 \times 10^{-4}$
Risk group, modified (consensus[b] 90%)		
Low risk (N = 116)	80%	$P = 0.53 \times 10^{-5}$
High risk (N = 55)	42%	

The Shimada Classification was applied to all evaluable neuroblastic tumors (N = 218). Histologic grade; risk group; histologic grade, modified; and risk group, modified were applied only to the neuroblastoma (Schwannian stroma-poor) tumors (N = 190).

[a] Survival is shown as the expected 3-year event free survival.

[b] Consensus was based on five of six or six of six agreements by the reviewer pathologists.

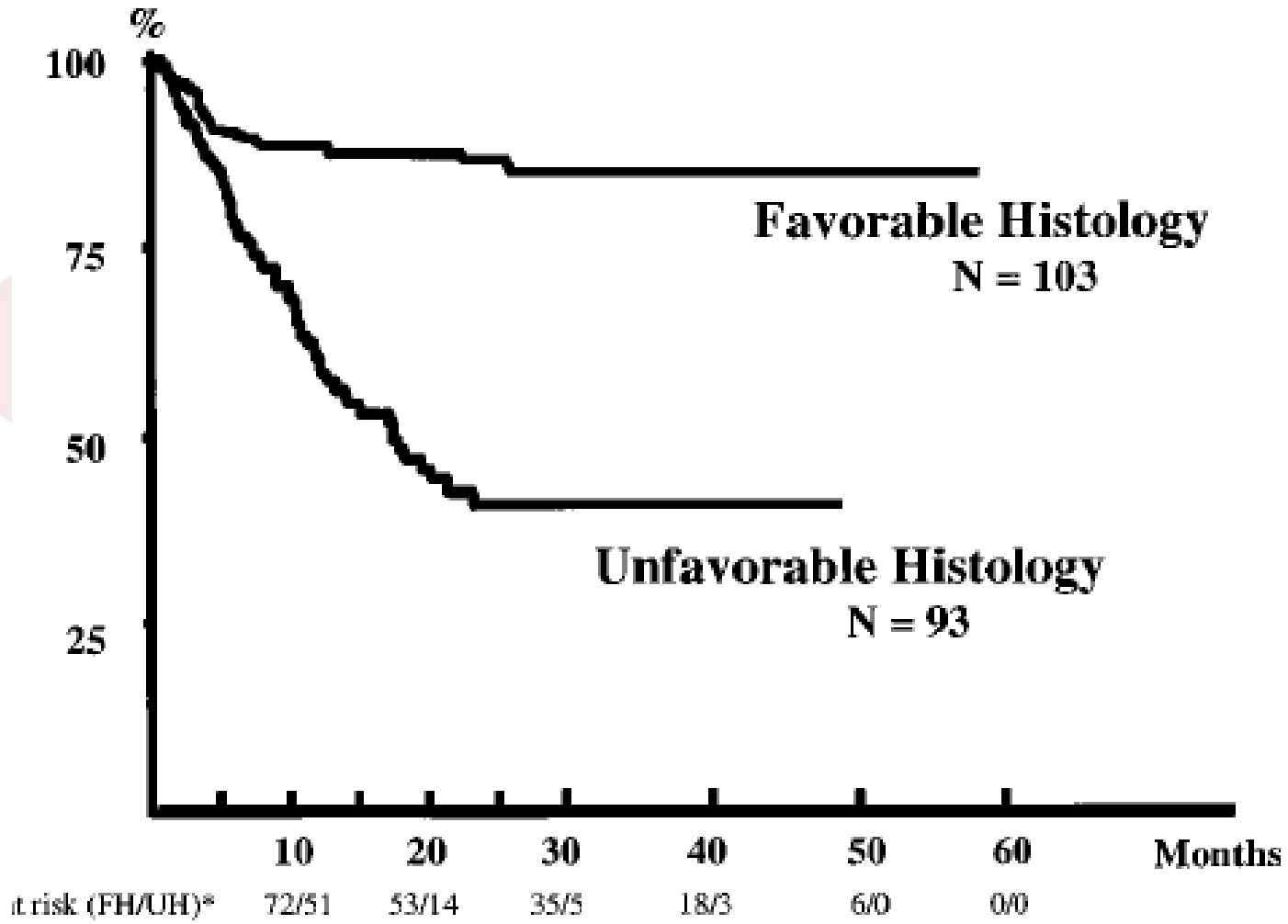

%
100
75
50
25
Favorable Histology
N = 103
Unfavorable Histology
N = 93
10
20
30
40
50
60
Months
t risk (FH/UH)*
72/51
53/14
35/5
18/3
6/0
0/0

TABLE 6
Prognostic Groups According to the International Neuroblastoma Pathology Classification: Case Distribution by Nonmorphologic Prognostic Factors

	International Neuroblastoma Pathology Classification (Shimada System)		
	Favorable histology	Unfavorable histology	*P* value
Age			
< 1 year	72	22	
≥ 1 year	31	71	< 0.0001
Clinical stage			
1 + 2 + 4-S	73	20	
3 + 4	30	73	< 0.0001
MYCN[a]			
Nonamplified	84	48	
Amplified	6	32	< 0.0001

[a] *MYCN* status was tested in 170 of 196 available cases.

TABLE 7
Prognostic Evaluation of Neuroblastic Tumors According to the International Neuroblastoma Pathology Classification (Shimada System)

International Neuroblastoma Pathology classification		Original Shimada classification	Prognostic group
Neuroblastoma	(Schwannian stroma-poor)[a]	Stroma-poor	
Favorable		Favorable	Favorable
< 1.5 yrs	Poorly differentiated or differentiating & low or intermediate MKI tumor		
1.5–5 yrs	Differentiating & low MKI tumor		
Unfavorable		Unfavorable	Unfavorable
< 1.5 yrs	a) undifferentiated tumor[b] b) high MKI tumor		
1.5–5 yrs	a) undifferentiated or poorly differentiated tumor b) intermediate or high MKI tumor		
≥5 yrs	All tumors		
Ganglioneuroblastoma, intermixed	(Schwannian stroma-rich)	Stroma-rich Intermixed (favorable)	Favorable[c]
Ganglioneuroma	(Schwannian stroma-dominant)		
Maturing		Well differentiated (favorable)	Favorable[c]
Mature		Ganglioneuroma	
Ganglioneuroblastoma, nodular	(composite Schwannian stroma-rich/ stroma-dominate and stroma-poor)	Stroma-rich nodular (unfavorable)	Unfavorable[c]

MKI: mitosis-karyorrhexis index.

VOLUME 27 · NUMBER 2 · JANUARY 10 2009

JOURNAL OF CLINICAL ONCOLOGY

SPECIAL ARTICLE

From the Department of Pediatrics, The University of Chicago, Chicago, IL; Section of Paediatrics, Institute of Cancer Research and Royal Marsden Hospital, Surrey; Children's Cancer and Leukaemia Group Data Centre, University of Leicester, Leicester, United Kingdom; Children's Oncology Group Statistics and Data Center, University of Florida, Gainesville, FL; Section for Paediatric Surgery, Division of Surgery, Rikshospitalet University Hospital, Oslo, Norway; Children's Cancer Research Institute, St Anna Kinderkrebsforschung, Vienna, Austria; Division of Oncology, The Children's Hospital of Philadelphia, Department of Pediatrics, The University of Penn-

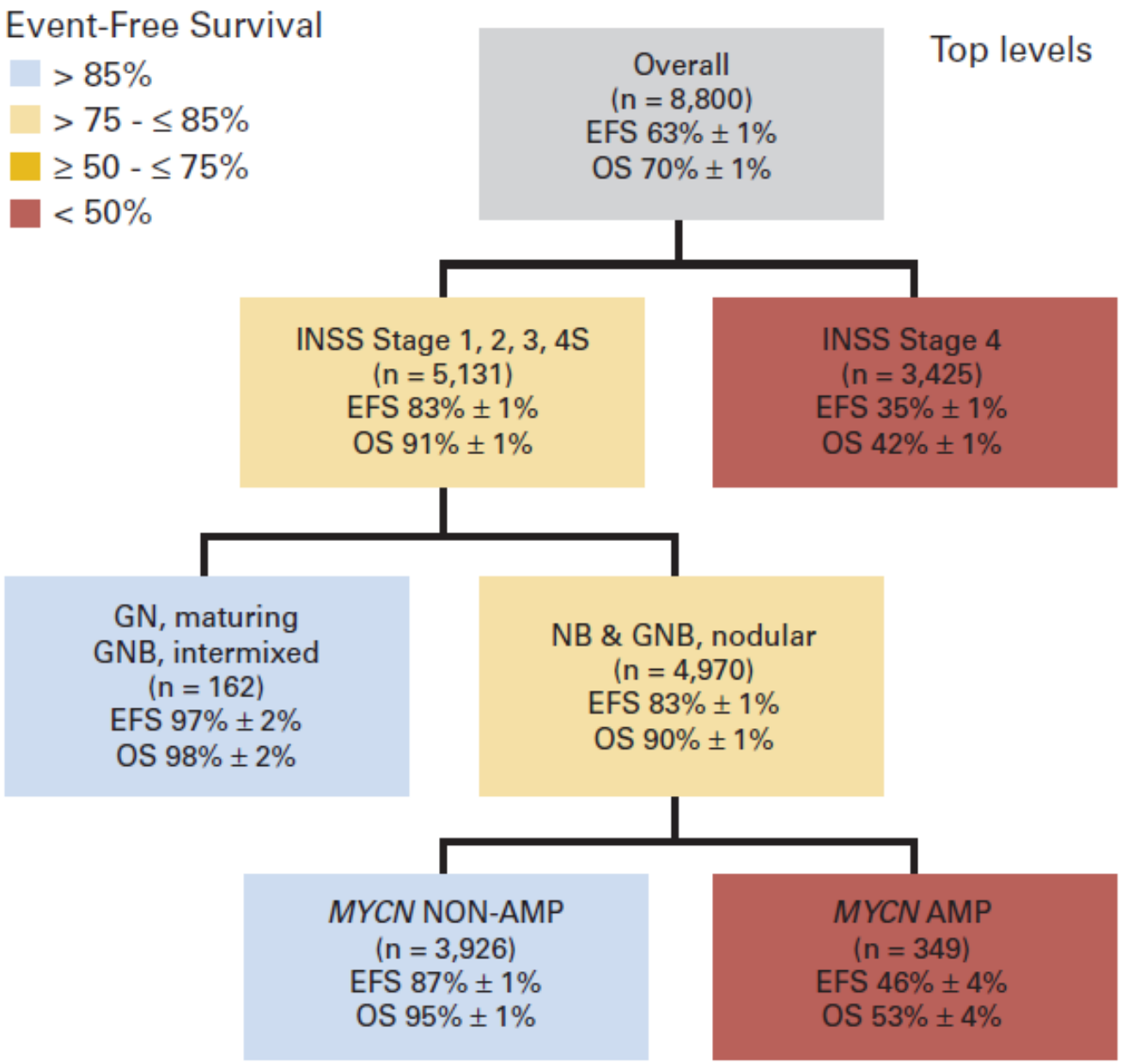
The International Neuroblastoma Risk Group (INRG) Classification System: An INRG Task Force Report

Susan L. Cohn, Andrew D.J. Pearson, Wendy B. London, Tom Monclair, Peter F. Ambros, Garrett M. Brodeur, Andreas Faldum, Barbara Hero, Tomoko Iehara, David Machin, Veronique Mosseri, Thorsten Simon, Alberto Garaventa, Victoria Castel, and Katherine K. Matthay

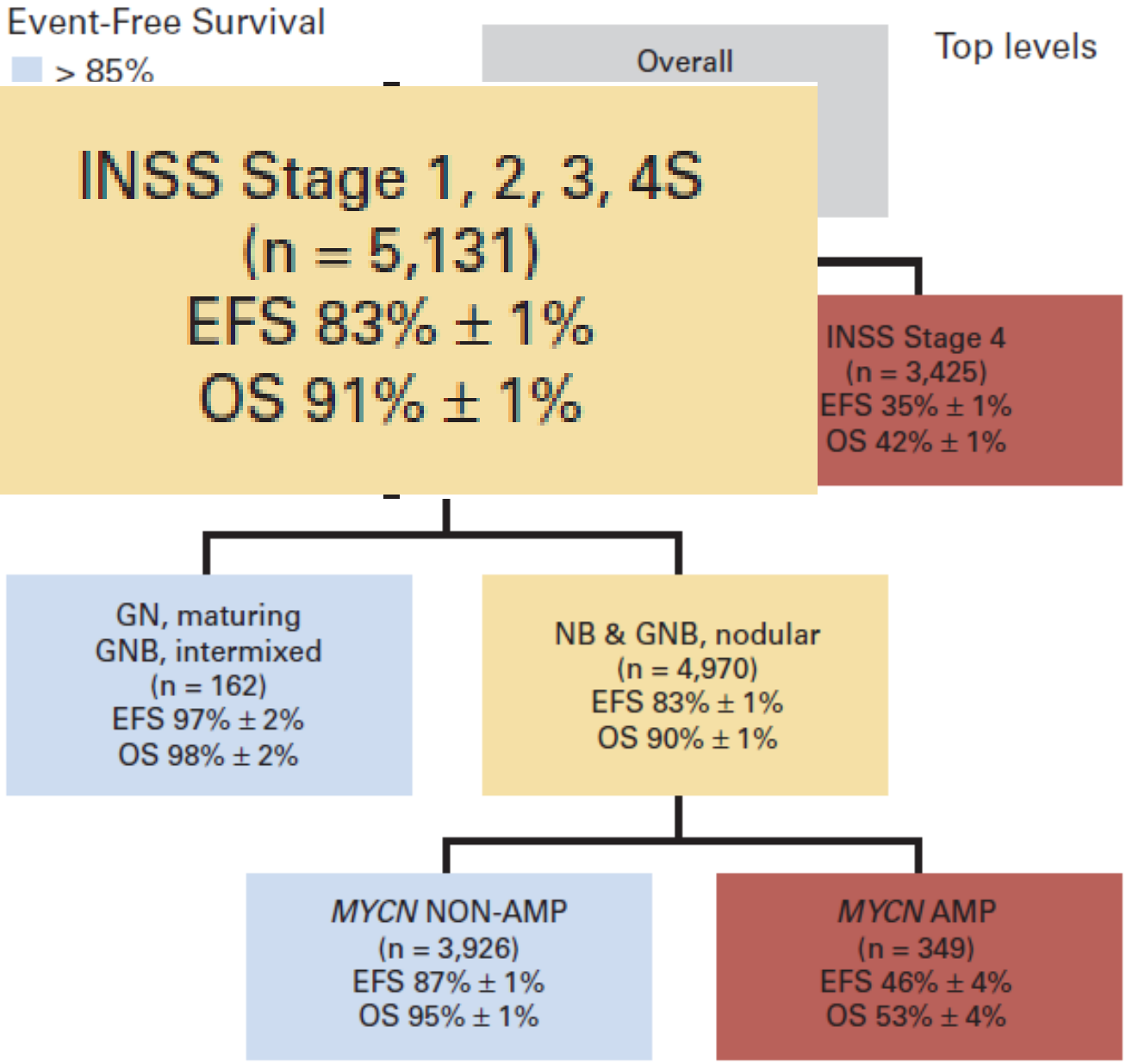
ABSTRACT

A

Cohn S et al. J Clin Oncol 27;2009



Cohn S et al. J Clin Oncol 27;2009



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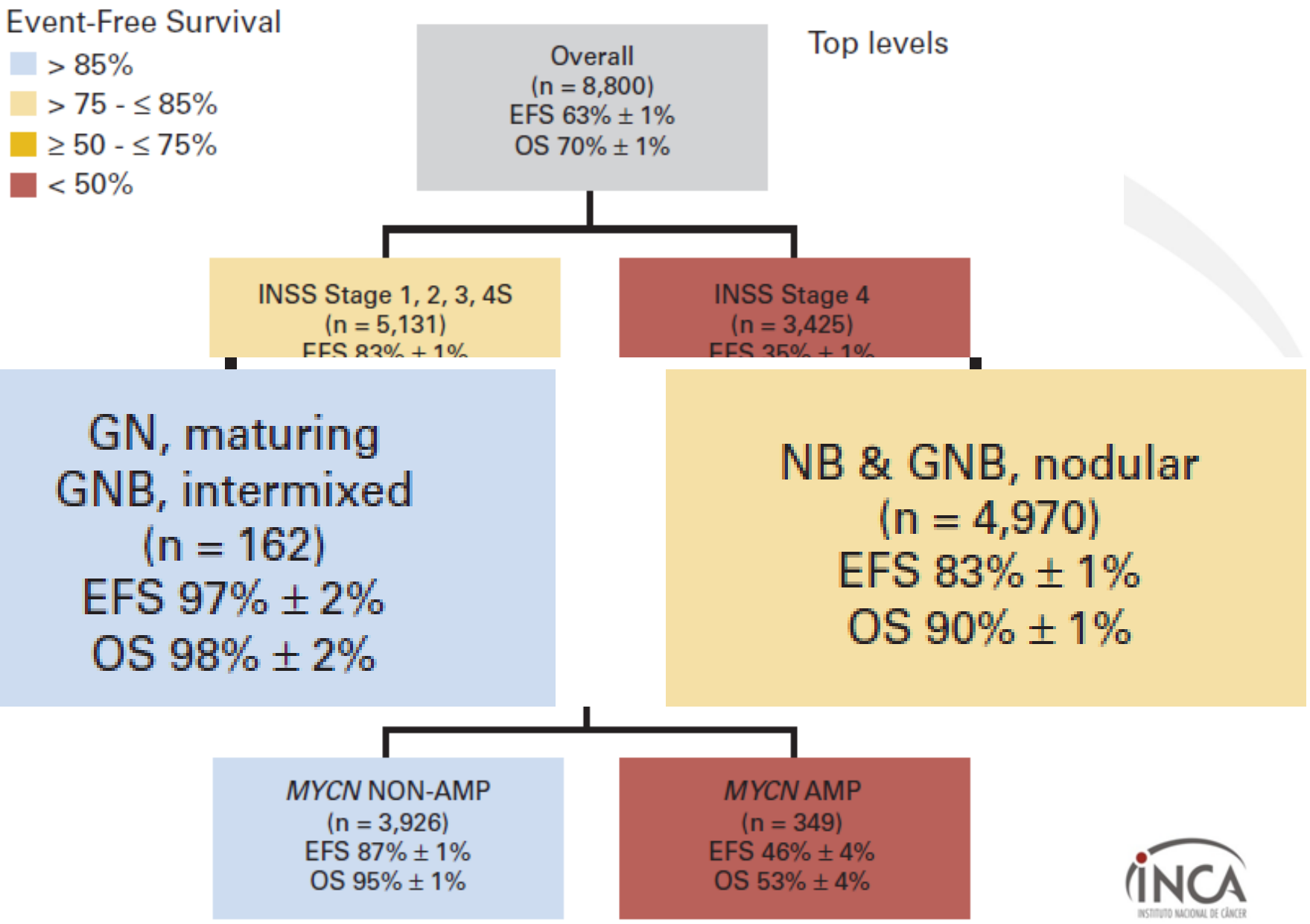

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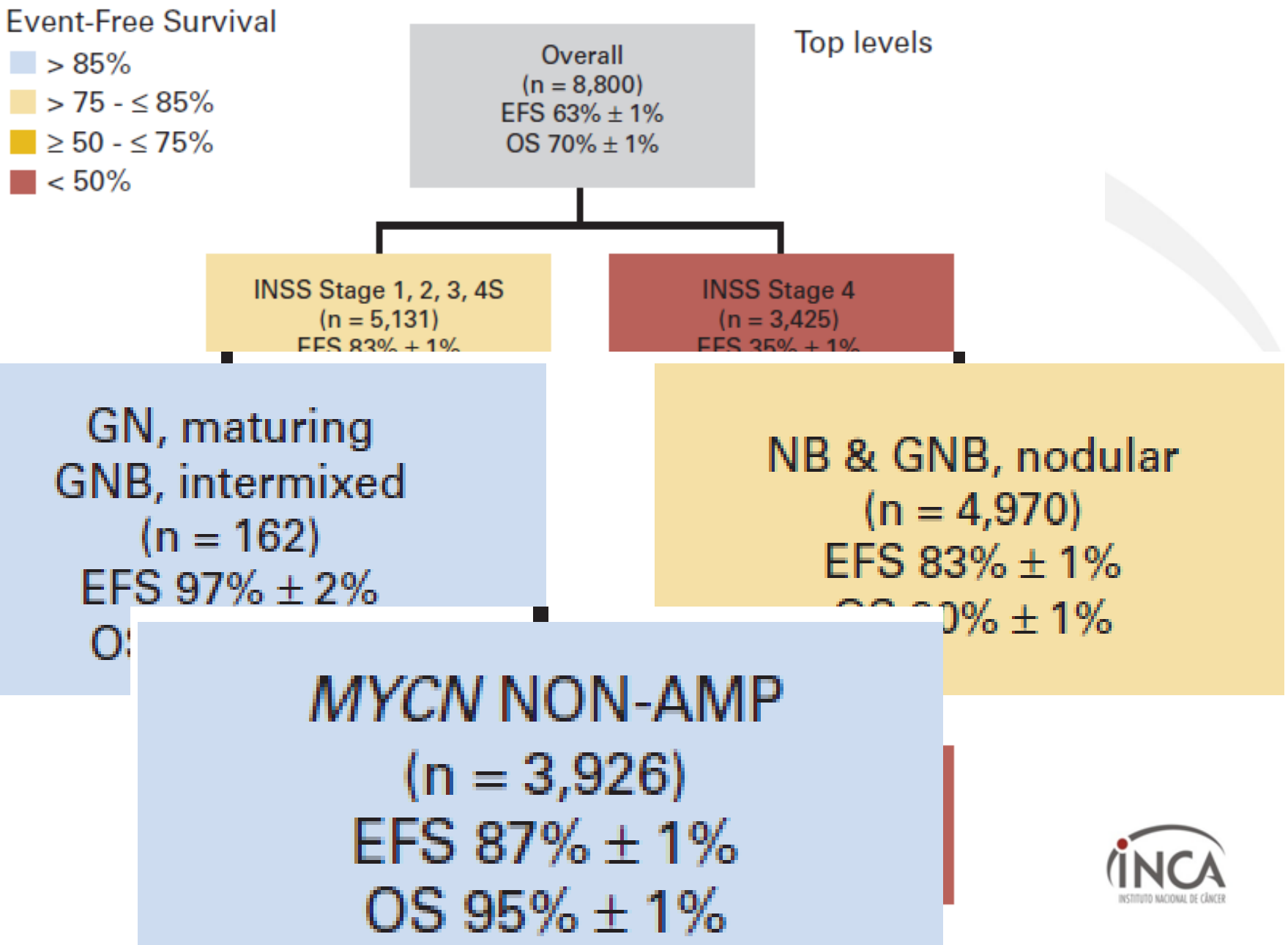
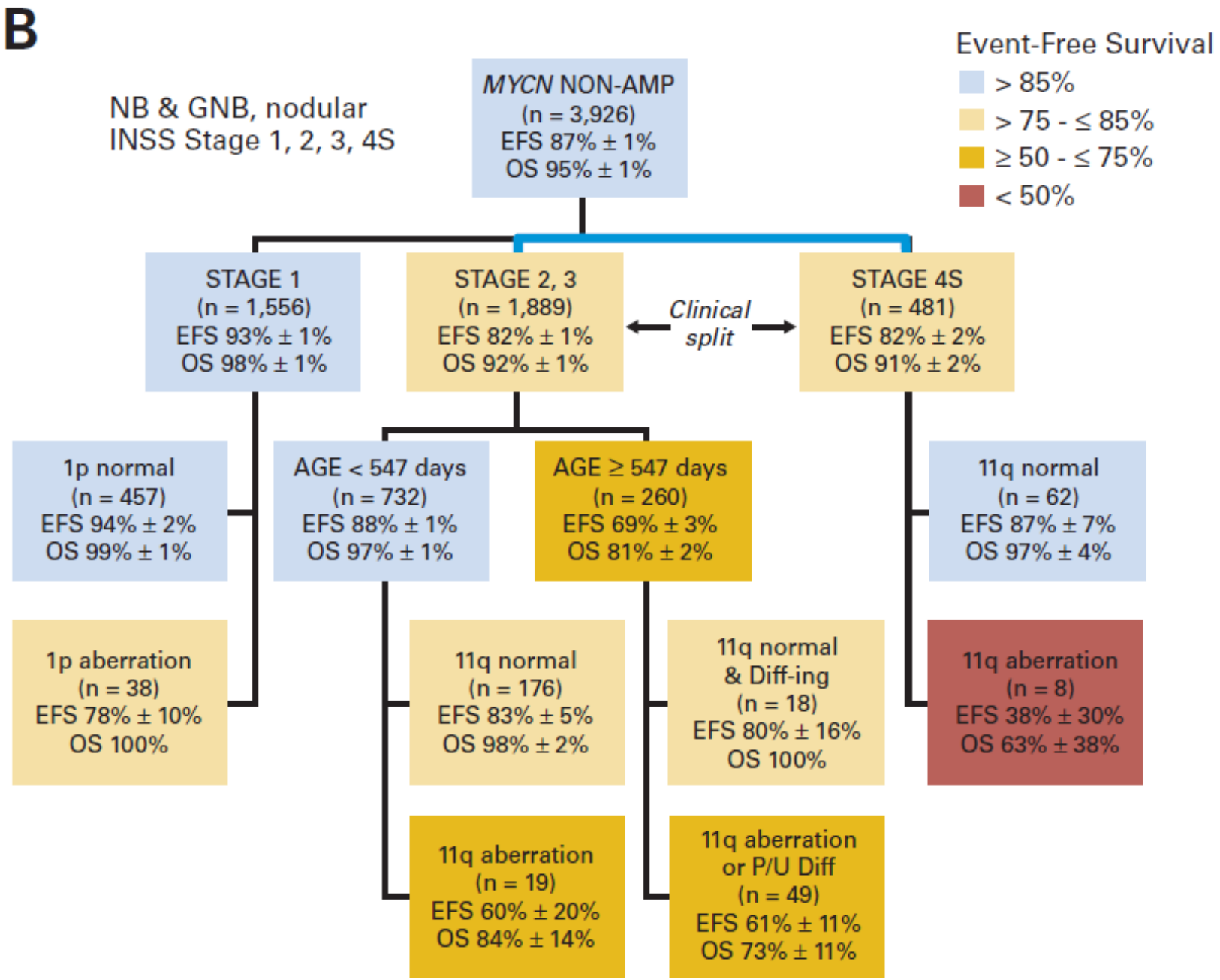
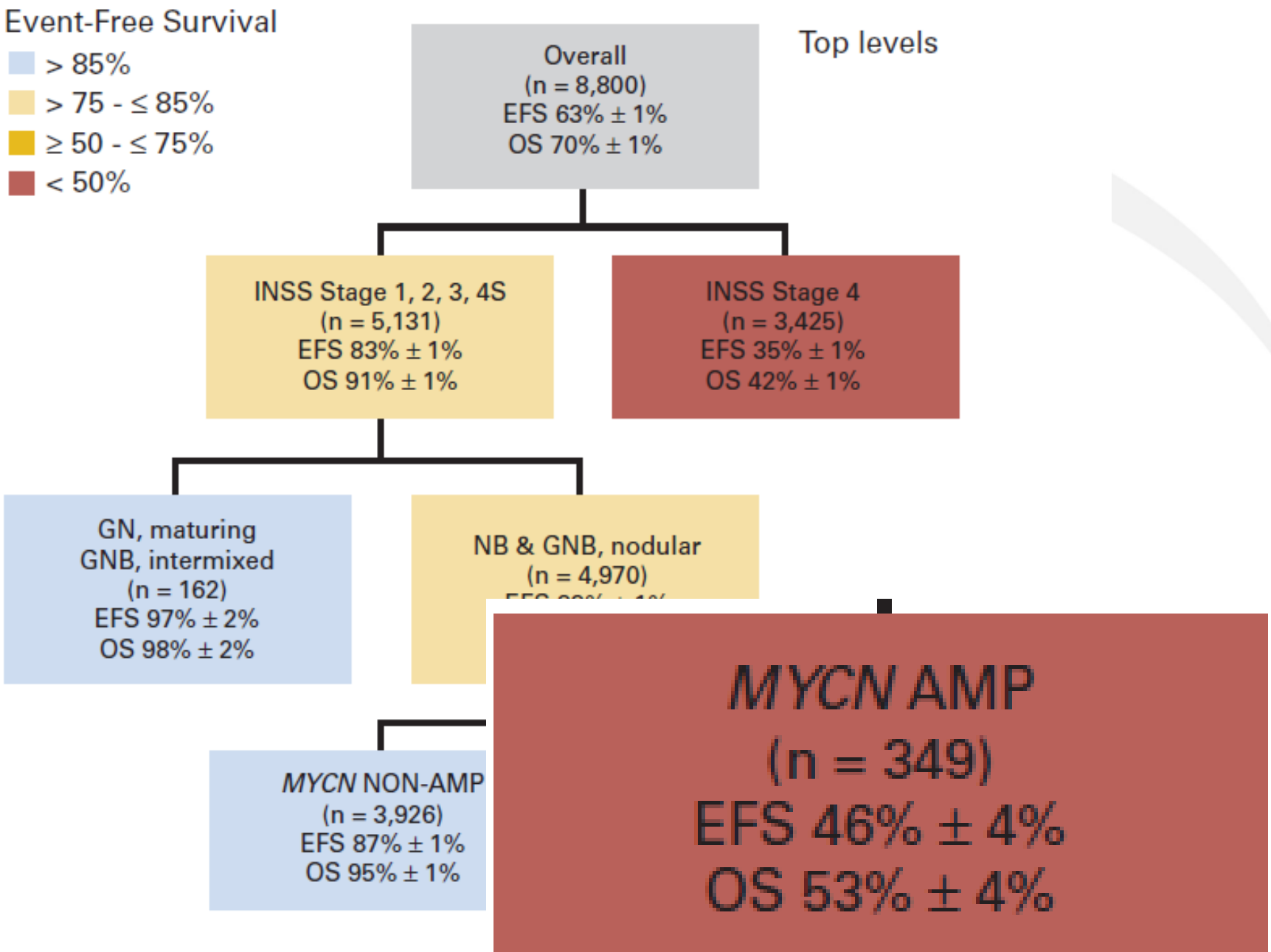


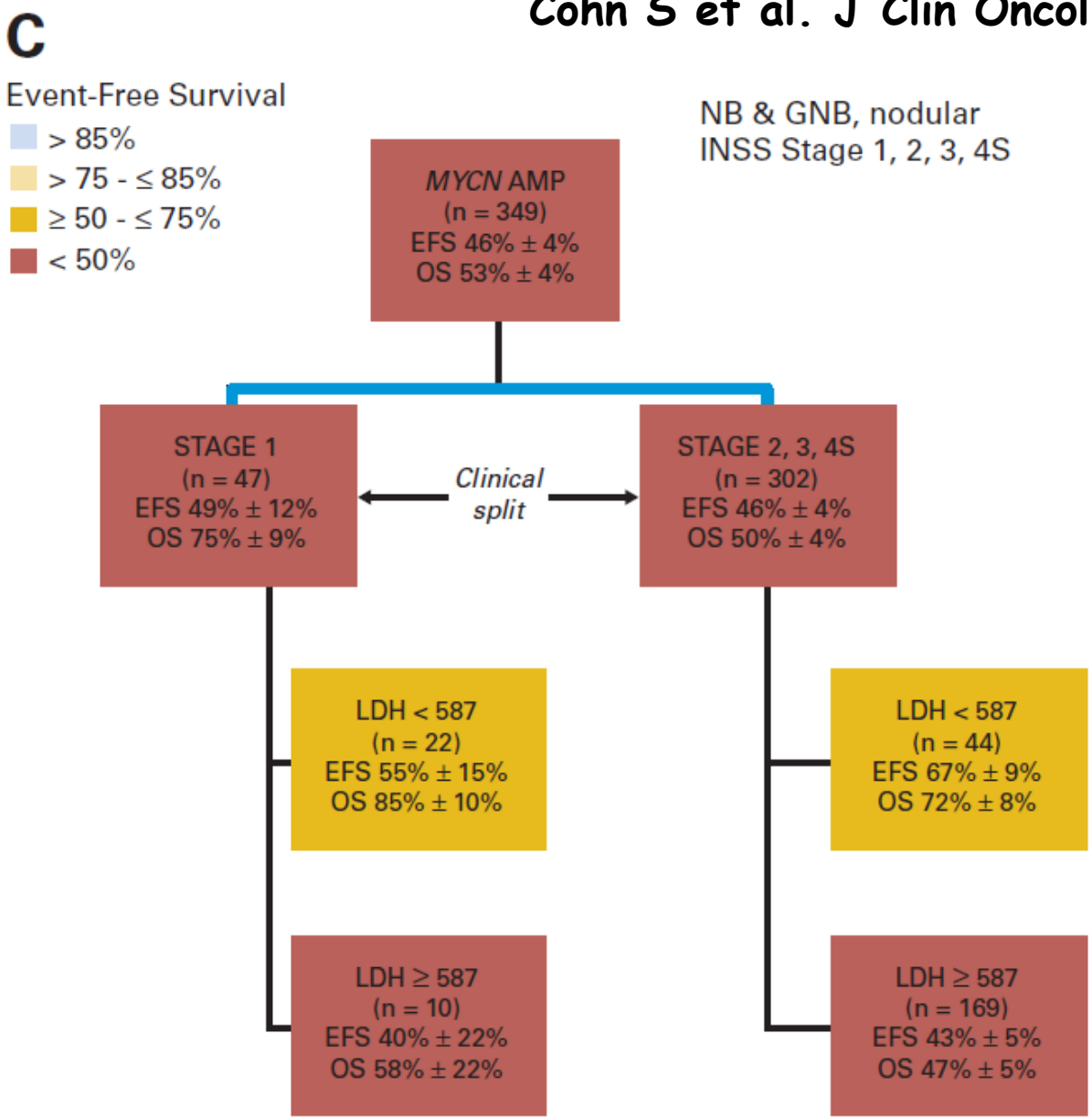
Cohn S et al. J Clin Oncol 27;2009



Cohn S et al. J Clin Oncol 27;2009



Cohn S et al. J Clin Oncol 27;2009



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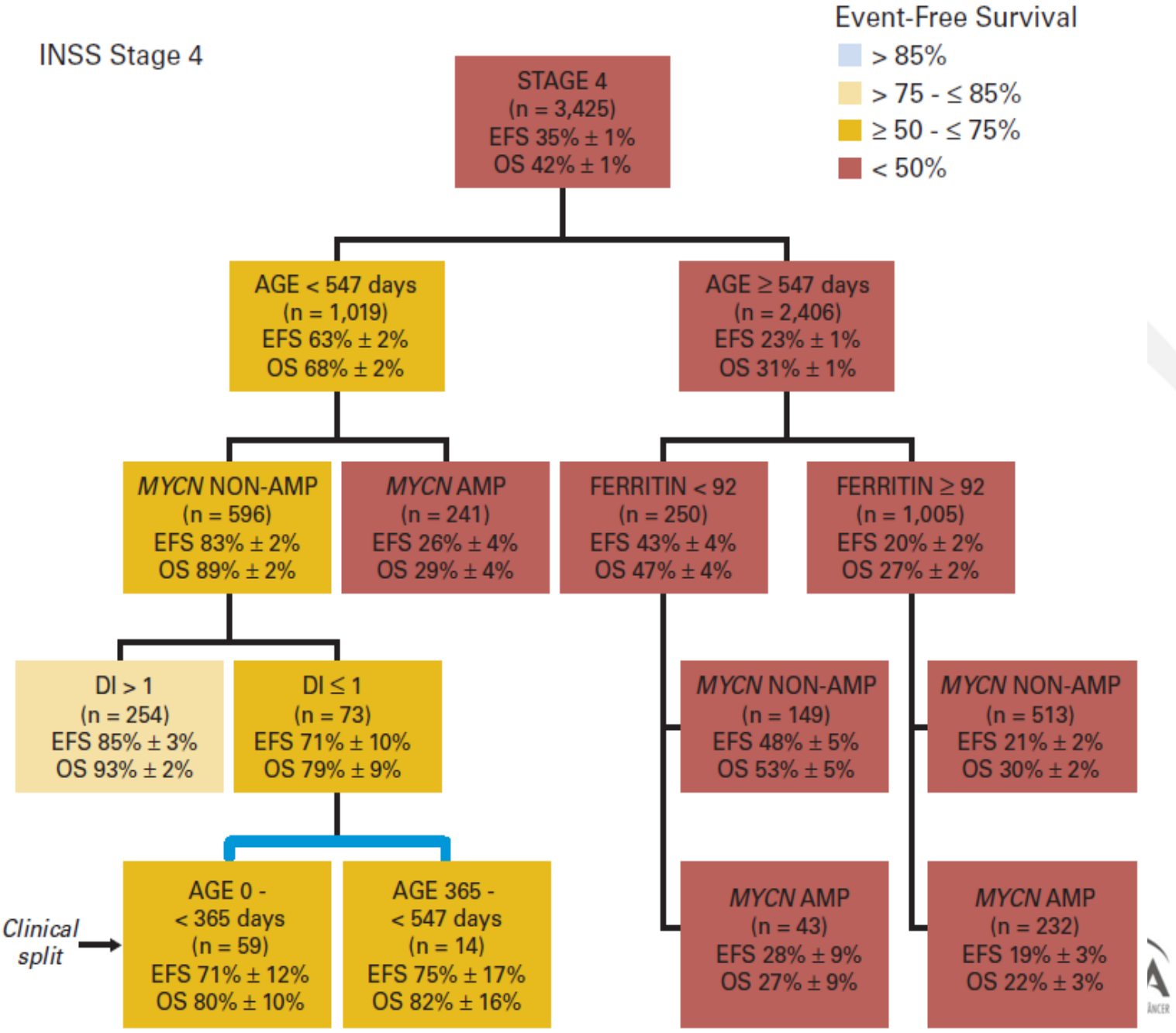
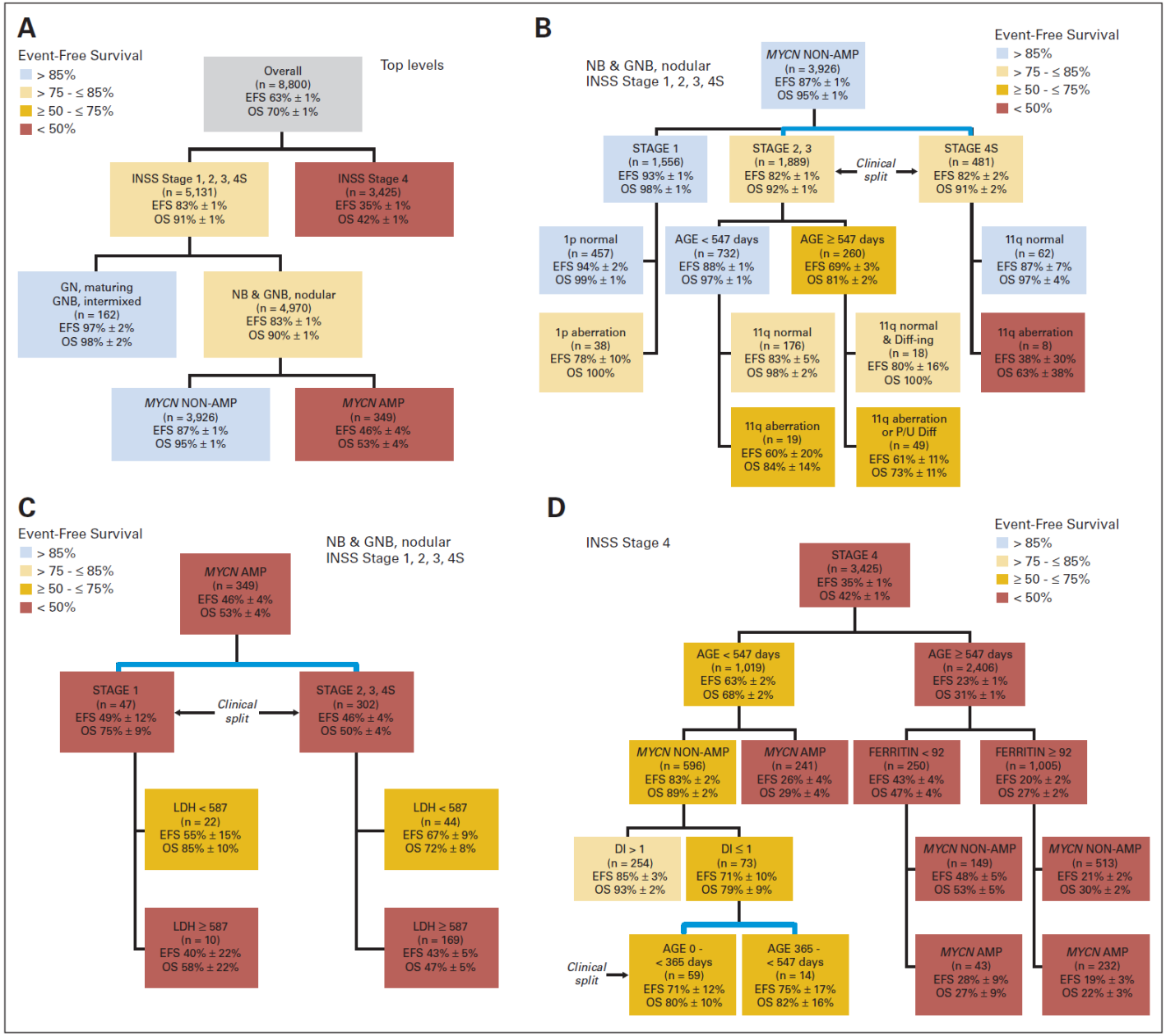
Cohn S et al. J Clin Oncol 27;2009



Classificação Internacional de grupos de risco



Cohn S et al. J Clin Oncol 27;2009

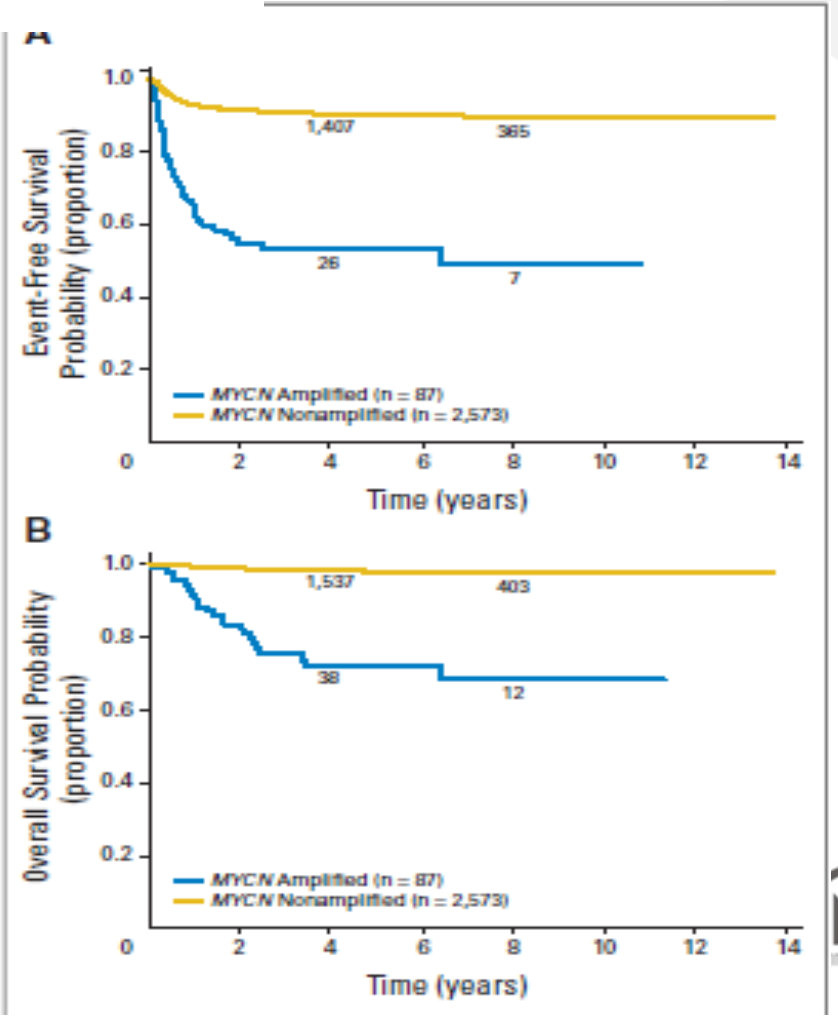
VOLUME 27 · NUMBER 3 · JANUARY 20 2009

JOURNAL OF CLINICAL ONCOLOGY

ORIGINAL REPORT

Significance of *MYCN* Amplification in International Neuroblastoma Staging System Stage 1 and 2 Neuroblastoma: A Report From the International Neuroblastoma Risk Group Database

Rochelle Bagatell, Maja Beck-Popovic, Wendy B. London, Yang Zhang, Andrew D.J. Pearson, Katherine K. Matthay, Tom Monclair, Peter F. Ambros, and Susan L. Cohn



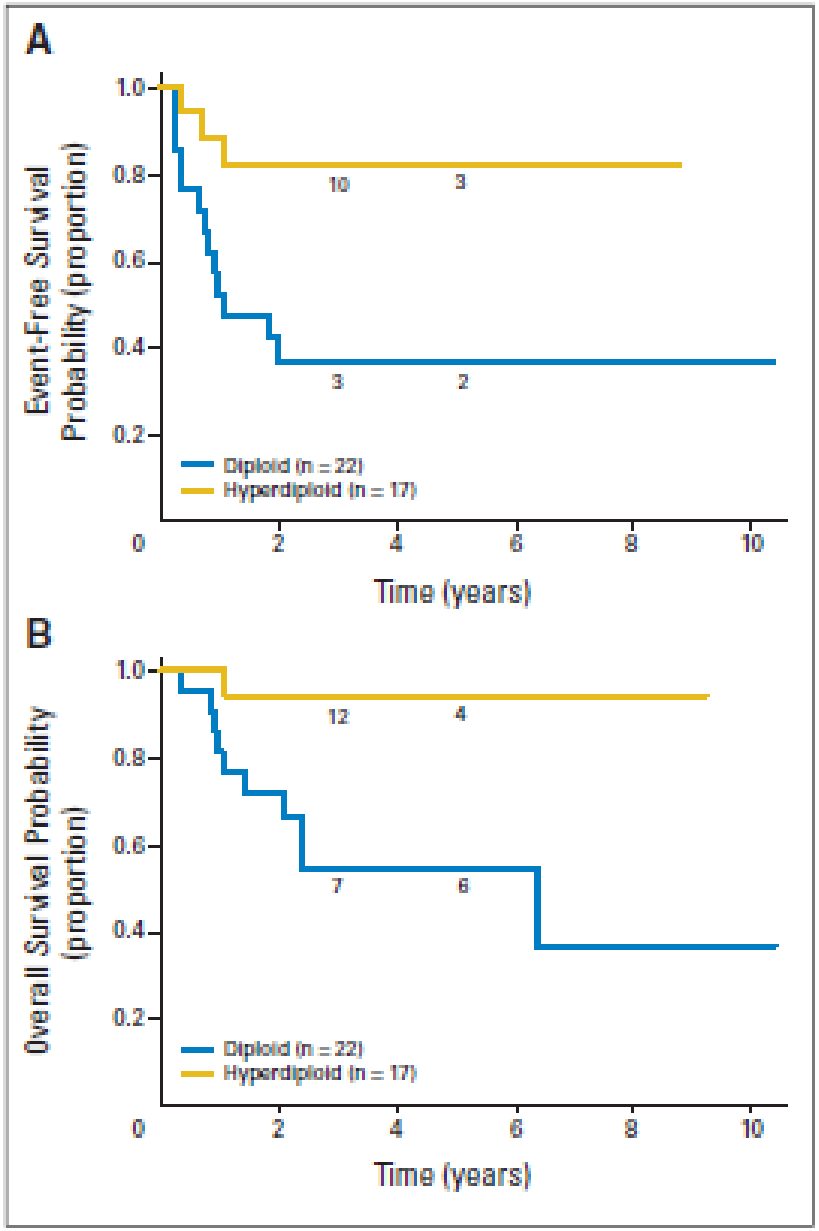


Fig 2. *MYCN* amplified International Neuroblastoma Staging System stage 1 and 2 patients (n = 87). (A) Event free and (B) overall survival curves for hyperdiploid (n = 17) versus diploid (n = 22) patients. The numbers of patients at risk for an event are shown along the curves at years 3 and 5.

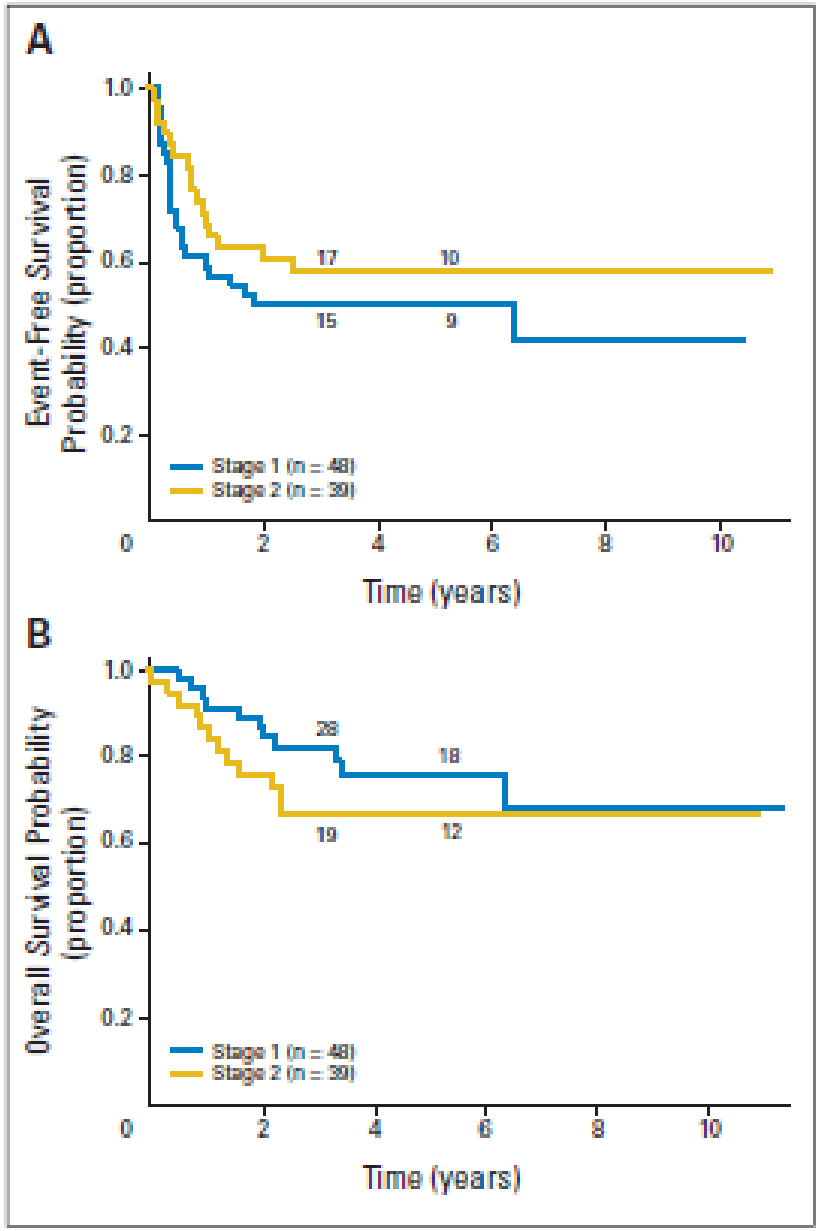


Fig 3. *MYCN* amplified International Neuroblastoma Staging System stage 1 and 2 patients (n = 87). (A) Event free and (B) overall survival curves for stage 1 (n = 48) versus stage 2 (n = 39) patients. The numbers of patients at risk for an event are shown along the curves at years 3 and 5.

British Journal of Cancer (2010) 102, 1319 – 1326

www.bjcancer.com

Guidelines

Criteria for evaluation of disease extent by ^{123}I-metaiodobenzylguanidine scans in neuroblastoma: a report for the International Neuroblastoma Risk Group (INRG) Task Force

- ✓Preparação do paciente
- ✓Administração
- ✓Tecnicas do mapeamento
- ✓Periocidade
- ✓Escore semi quantitativo
- ✓Prognóstico
- ✓Avaliação resposta

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International consensus for neuroblastoma molecular diagnostics: report from the International Neuroblastoma Risk Group (INRG) Biology Committee

PF Ambros[*,1], IM Ambros[*,1], GM Brodeur[2], M Haber[3], J Khan[4], A Nakagawara[5], G Schleiermacher[6], F Speleman[7], R Spitz[8], WB London[9], SL Cohn[10], ADJ Pearson[11] and JM Maris[*,2]

[1]CCRI, Children's Cancer Research Institute, Vienna, Austria; [2]Center for Childhood Cancer Research, Children's Hospital of Philadelphia, University of Pennsylvania School of Medicine, PA, USA; [3]Children's Cancer Institute Australia, Sydney, Australia; [4]National Cancer Institute, Bethesda, MD, USA; [5]Chiba Cancer Center Research Institute, Japan; [6]Institut Curie, Paris, France; [7]Centre for Medical Genetics, Ghent, Belgium; [8]University of Cologne, Germany; [9]Children's Oncology Group Statistics and Data Center, University of Florida, Gainesville, FL, USA; [10]The University of Chicago, Chicago, IL, USA; [11]Section of Paediatrics, Institute of Cancer Research and Royal Marsden Hospital, Surrey, UK

Table 1 Tests of association of genetic factors

	MYCN amplification	1p aberration	11q aberration	17q gain
Diploidy	$P < 0.0001$	$P < 0.0001$	$P = 0.1242$	$P = 0.3613$
MNA		$P < 0.0001$	$P = 0.0006$*	$P = 0.0096$
1p aberration			$P = 0.0613$	$P < 0.0001$
11q aberration				$P < 0.0001$

Table 3 Consensus of genetic markers currently used for therapy stratification and proposed for future analyses

Genetic l classificat		
Obligator	Obligatory markers	
MYCN	*MYCN*	one for the *MYCN* gene and a clone of nosome 2 (e.g., LAF at 2q11); ver possible
11q23	11q23	
Ploidy	Ploidy	s a diploid standard
Genetic n analysed		
1p		
2p		
DDX1		
NAG		
ALK		
3p		
4p		
7q		
9p		
12p		
14q		
17q		
Others	aCGH, SNP arrays	

aCGH—array-based comparative genomic hybridisation; BAC—bacterial artificial chromosomes; I-FISH—interphase fluorescence in situ hybridisation; INRG—International Neuroblastoma Risk Group; MLPA—multiplex ligation-dependent probe amplification; PCR—polymerase chain reaction; SNP—single nucleotide polymorphism.

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Lung Metastases in Neuroblastoma at Initial Diagnosis: A Report from the International Neuroblastoma Risk Group (INRG) Project

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Consensus criteria for sensitive detection of minimal neuroblastoma cells in bone marrow, blood and stem cell preparations by immunocytology and QRT-PCR: recommendations by the International Neuroblastoma Risk Group Task Force

Definir os critérios é o primeiro passo para identificar e avaliar os marcadores DMR para aplicação clinica.

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ORIGINAL REPORT

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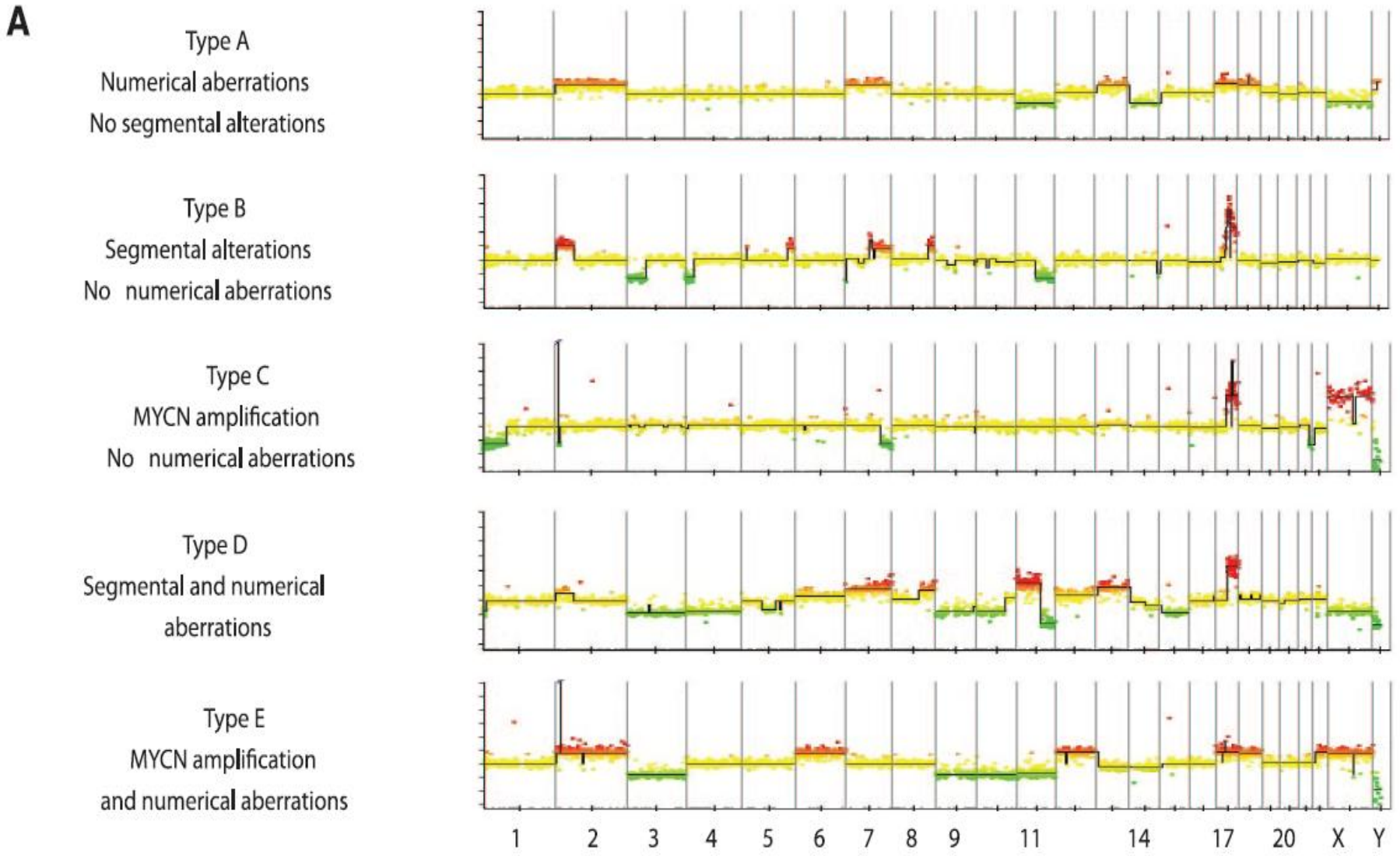
Overall Genomic Pattern Is a Predictor of Outcome in Neuroblastoma

Isabelle Janoueix-Lerosey, Gudrun Schleiermacher, Evi Michels, Véronique Mosseri, Agnès Ribeiro, Delphine Lequin, Joëlle Vermeulen, Jérôme Couturier, Michel Peuchmaur, Alexander Valent, Dominique Plantaz, Hervé Rubie, Dominique Valteau-Couanet, Caroline Thomas, Valérie Combaret, Raphaël Rousseau, Angelika Eggert, Jean Michon, Frank Speleman, and Olivier Delattre

Overall Genomic Pattern Is a Predictor of Outcome in Neuroblastoma



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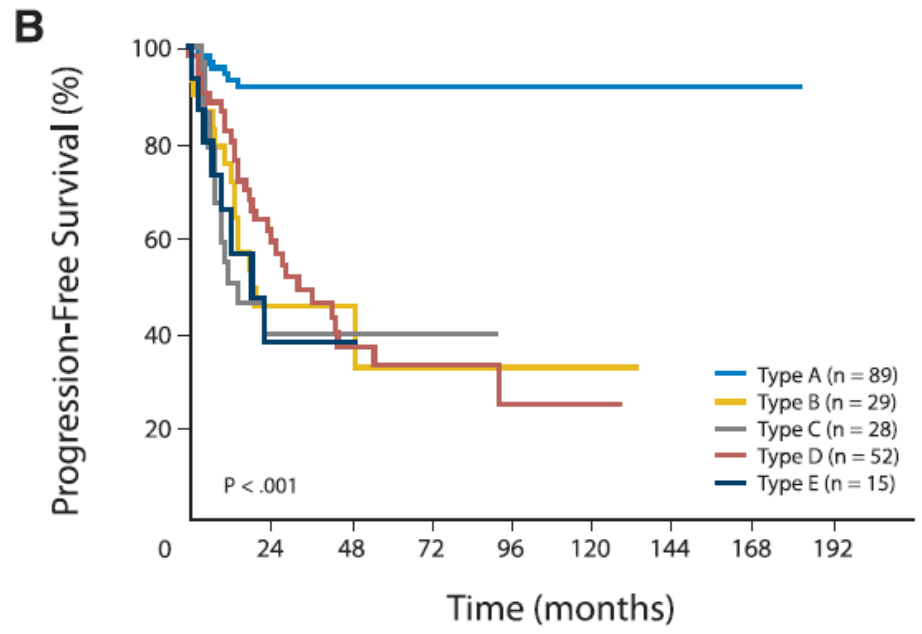

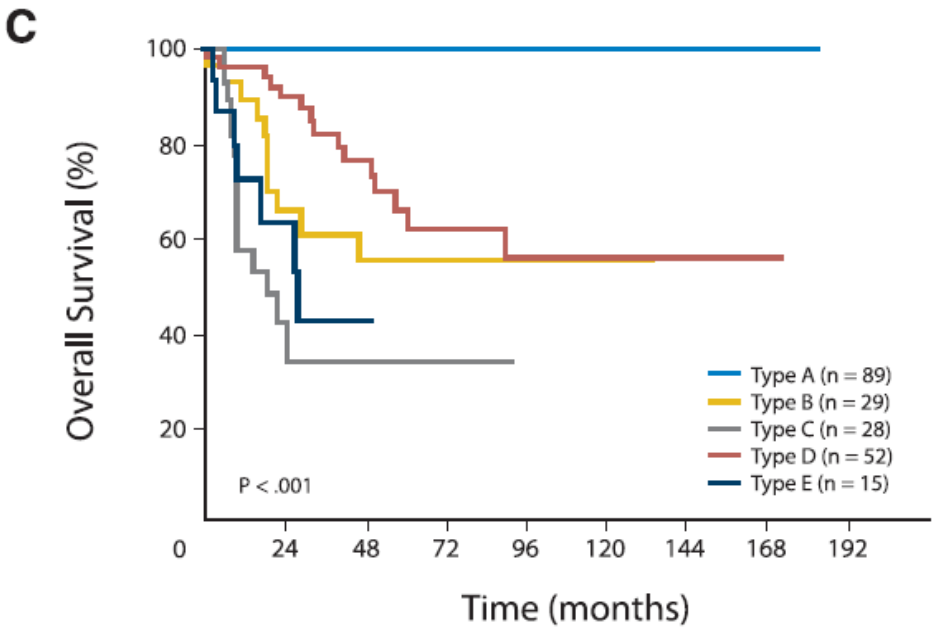

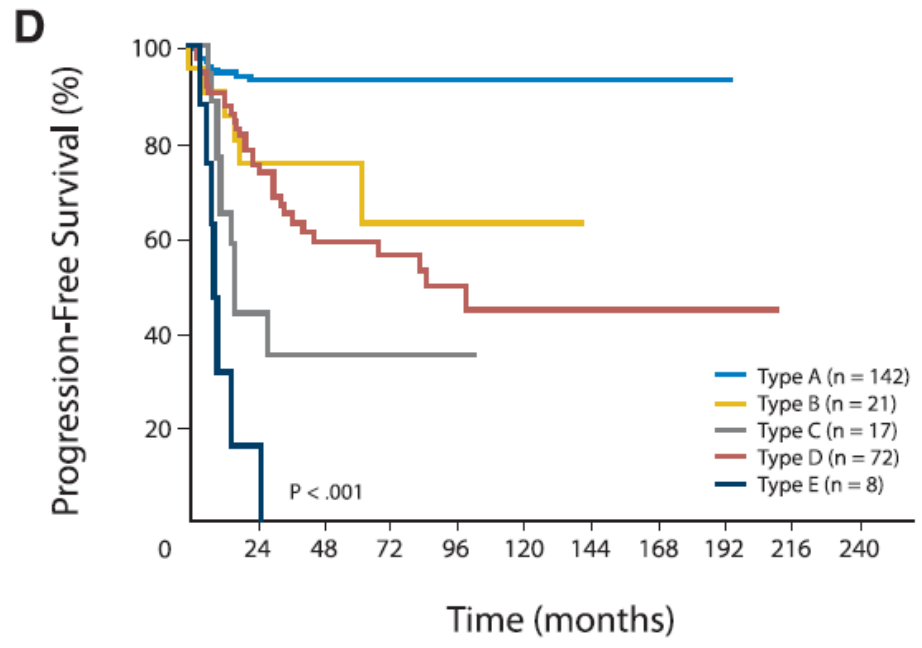

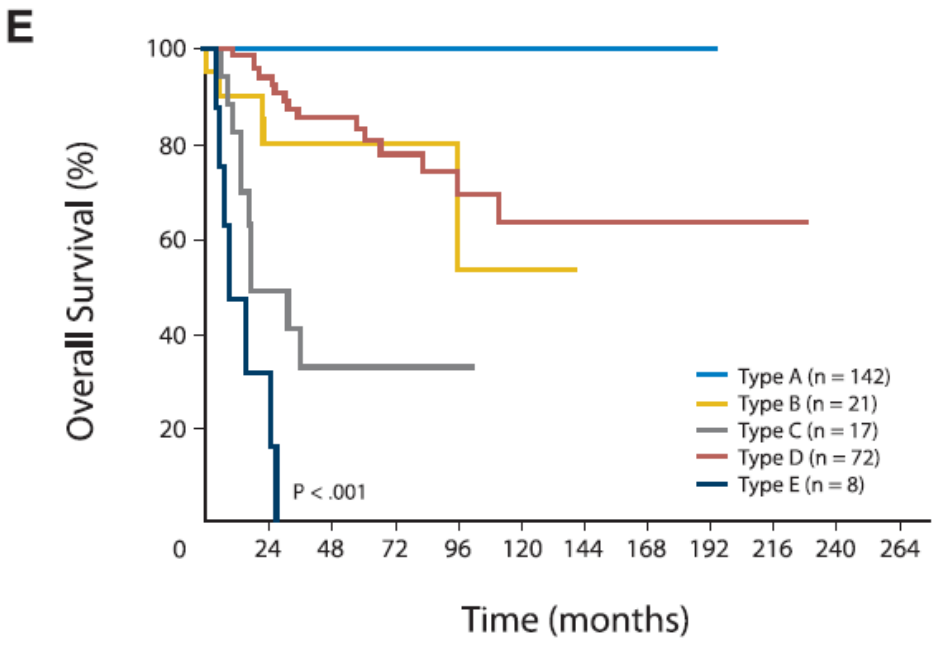

The development of an effective therapy for *neuroblastoma* has provided one of the major frustations in pediatric oncology

EVANS A.1980

" neuroblastoma is an unpredictable tumor "

Dargeon HW. 1962

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