

Neuroblastoma

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(neuroblasts) (neuroblastoma)

(Neurons)
(central nervous system)
(peripheral nervous system)
(autonomic nervous system)

(sympathetic nervous system)
(parasympathetic)
(medulla)

(neuroblasts)
()

(opsoclonus)
(myoclonus)

(paraneoplastic syndromes)

programmed cell) ()

(apoptosis)

(death

(ganglioneuroma)

(ganglion)

(ganglioneuroblastoma)

(Risk factors)

(anticonvulsants)

(diuretics)

(folic acid)

()

(genes)
(deoxyribonucleic acid DNA)

(chromosomes)

Tumor suppressor) (Proto-oncogenes)
(genes

()

(mutations)

:

(Translocation)

•

(inversion)

•

()

(addition)

•

(deletion)

•

(oncogene) ()
() ()
() ()

(deletion)

1

11

14

17

(superior vena cava syndrome)

()

)

(

(consumption coagulopathy)

(opsoclonus myoclonus ataxia syndrome)

(Computed tomography scan)

Magnetic resonance imaging)

(

(biopsy)

(technetium99) 99

(meta-iodobenzylguanidine MIBG scan)

(neurotransmitters)

(metabolites) (catecholamines)

)

(

(Bone marrow biopsy)

.(

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(Staging)

(grading)

(unfavorable histology)

(favorable histology)

(International Neuroblastoma Staging System INSS)

	:	
(Localized resectable)	:	1
	.	
(Localized unresectable)	:	2
	.	
	:	
)	:	2
	.	(
	:	2
	.	
	:	
(Regional)	:	3
	.	
	:	
(Disseminated)	:	4
	.	
4	.	
	:	
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)	.	
	.	
	:	(

(Recurrent)

(prognostic factors)

:

18

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:

(DNA ploidy)
(flow cytometry)
(diploid)
(hyperdiploid)
(hypodiploid)
(tetraploid)

:

(imaging cytometry)

: (Cytogenetics)

(chromosomes)

17

11

1

: (Oncogene amplifications)

(Proto-oncogenes)

(oncogenes)

(N-myc oncogene)

:

(ferritin)

(lactate dehydrogenase LDH)

(Neuron specific enolase NSE)

(Low risk)

:

(High Risk)

(Intermediate Risk)

:

:

: (Low risk)

1

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() 2

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() 2

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4

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: (Intermediate Risk)

•	•	3	•
•	•	3	•
•	•	4	•
()	4	•

(High Risk)

•	()	2	•
•	•	•	3	•
•	•	•	3	•
•	•	•	3	•
•	•	•	4	•
•	•	•	4	•
•	•	•	4	•

(systemic)

(Neoadjuvant)

.(adjuvant)

:

(catheters)

.(Ommaya reservoir)

)

(

)

(

meta-)

(iodobenzylguanidine MIBG

.()

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)

(

(Stem cells)

()

(

)

(Bone marrow transplant)

(Stem cells transplant)

(

)

(Autologous)
(Allogeneic)

(human leukocyte antigens HLA)

(peripheral stem cells)

()

(retinoids) ()
(differentiating agents)

(13-*cis*-retinoic acid) 13 ()

4

:

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4

(doxorubicin)

(carboplatin)

(cyclophosphamide)
(etoposide)

:

24 12)

(

:

(13-cis retinoic acid) 13 ()

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-

(Regional)

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-

(Disseminated)

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(4s) 4

(Recurrent)

(meta-iodobenzylguanidine MIBG)

(13-cis retinoic acid) 13 ()

) % 55 % 85
% 40
% 90 % 85
% 80 % 30 % 95
% 25 % 95

) (

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