



Primary tumor volume of nasopharyngeal carcinoma : significance for survival

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Aim of this study:

- Numerous staging systems for NPC:
which one is better?
- The Ho's system is widely used in China.
- The AJCC TNM staging system for Nasopharyngeal Carcinoma (NPC) is widely used and accepted.
- Its application in endemic area receives lots of challenge.



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Any other staging systems or methods?

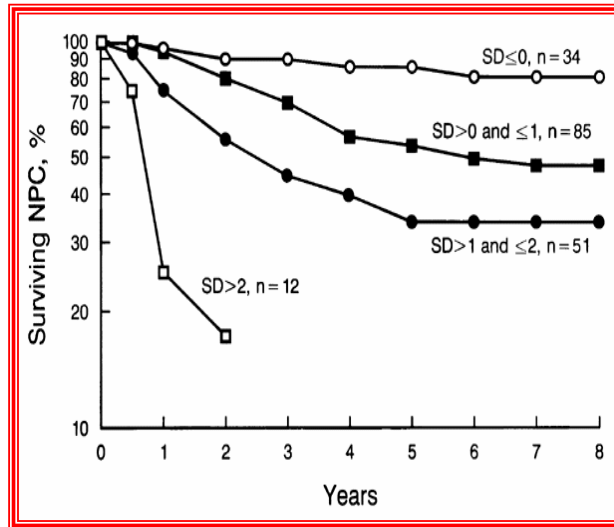
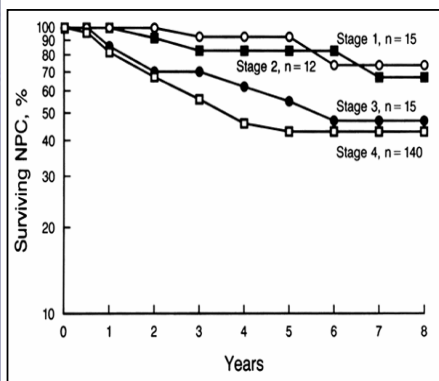
- *Neel and Taylor* developed a working formulation: presence of seven or more symptoms, nodes in lower neck or supra-clavicular fossa, WHO type I, extensive tumor in nasopharynx, symptoms present less than 2 months
- Score to death (SD)



尊重生命·人本醫療



Neel and Taylor's classification



Good classification!

Prospective study in endemic area like Taiwan is lacking!

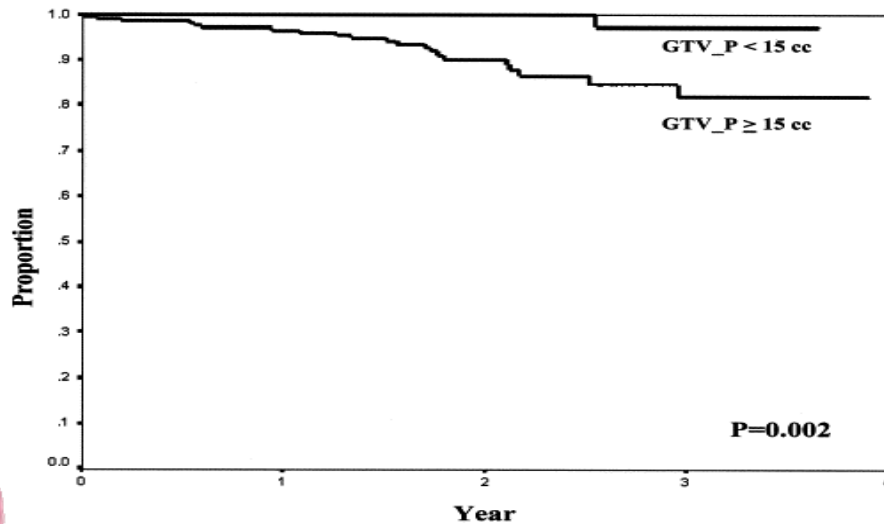


- Willner et al. and Chu et al. stated that increasing tumor bulk means increasing number of clonogen to be sterilized.
- Primary tumor volume had been reported to have close relationship in head and neck cancer.
- Chu et al. and Sze et al. found the importance of primary tumor volume in NPC → related to recurrence, survival





Sze et al: improved local control rate in PTV<15 ml group (Int J Radiat Oncol Biol Phys,2004)

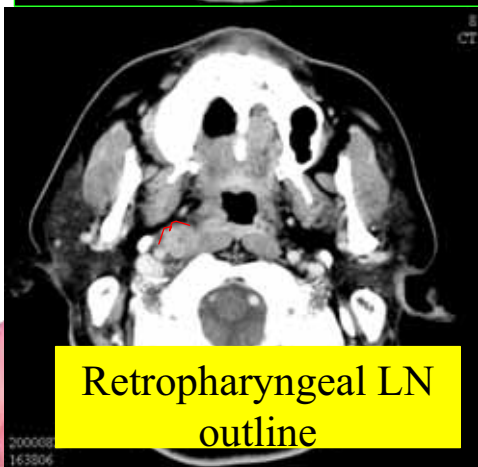
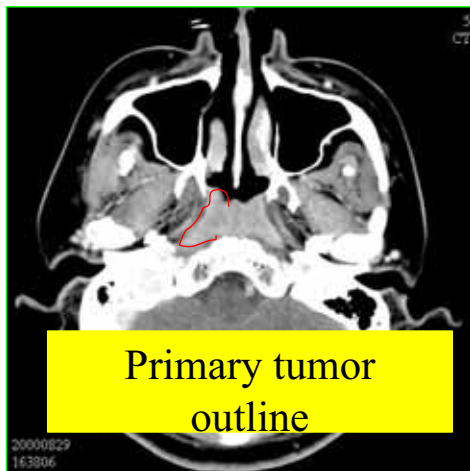


Methods:

- 71 newly diagnosed NPC and received complete treatment in our hospital
- Retrospectively trace tumor contour(primary tumor volume and retropharyngeal LN)
- The outline area was automatically calculated by computer.
- Summation of area of technique to calculate the tumor volume.

Method:

- All patients received RT: dosage 70-75 Gy
- 56 pts received 3 cycles of cisplatin and 5-fluorouracil (cisplatin 100 mg/m² intravenous infusion on day 1 , 5-fluorouracil 1000 mg/m² for 24-hour continuous infusion days 2 to 6)
- Follow up regularly in OPD
- CXR, abdominal sonogram , bone scan and CT were performed when they were indicated clinically





Results: Table 1. Patient characteristic

Table 1. Patient characteristics , T-classification of nasopharyngeal carcinoma and tumor volume

Characteristic	No. of patients (%)				Total
	T1	T2	T3	T4	
Total number	12(16.9%)	22(31.0%)	30(42.3%)	7(9.9%)	71
Gender					
Male	7(58.3%)	15(68.2%)	22(73.3%)	6(85.7%)	50(70.4%)
Female	5(41.7%)	7(31.8%)	8(26.7%)	1(14.3%)	21(29.6%)
Age(years)					
Mean±SD	51.5±12.4	50.1±14.6	48.5±9.5	46.7±14.7	49.3±12.1
Range	31-71	26-80	33-72	27-56	26-80
Tumor volume(ml)					
Mean±SD	3.76±2.50	9.54± 4.89	18.27± 9.09	76.66±54.99	18.87±26.50
Range	1.25-8.40	3.64-20.35	4.18-40.82	19.26-166.58	1.25-166.58
Median	2.62	8.56 ↑	15.96 ↑	64.47 ↑	11.39

SD: standard deviation





Fig 1. PTV and T stage relationship

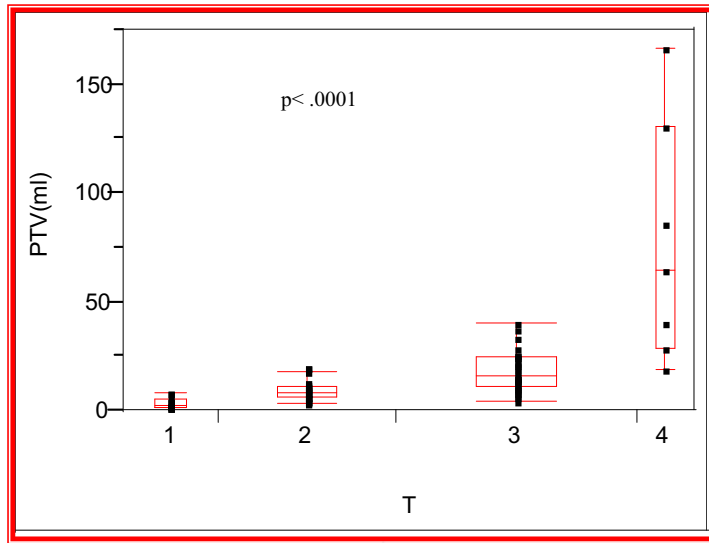


Fig. 1. Correlation between T stage and primary tumor volume (PTV).



Fig 2. Cumulative survival rates by disease stage

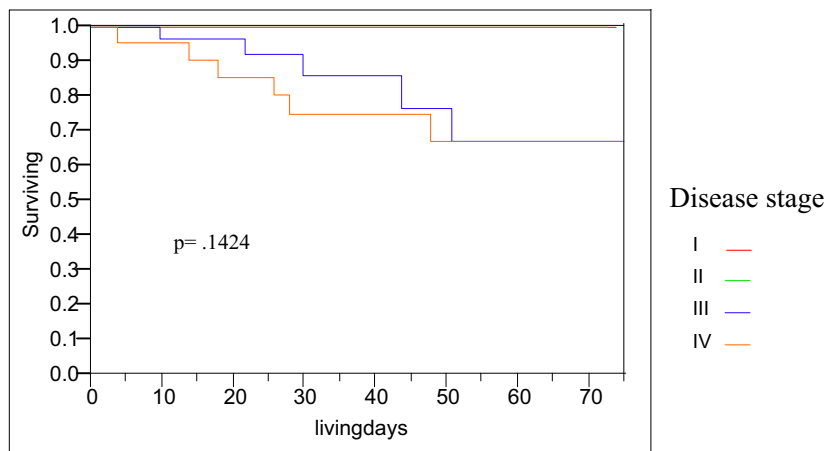


Fig. 2. Cumulative survival rates by disease stage (Stage I, II, III and IV). Vertical axis, survival ; horizontal axis, months.

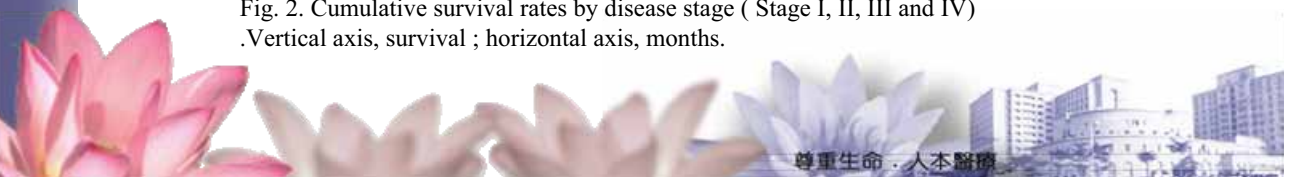




Fig 3. Cumulative survival rates by tumor classification

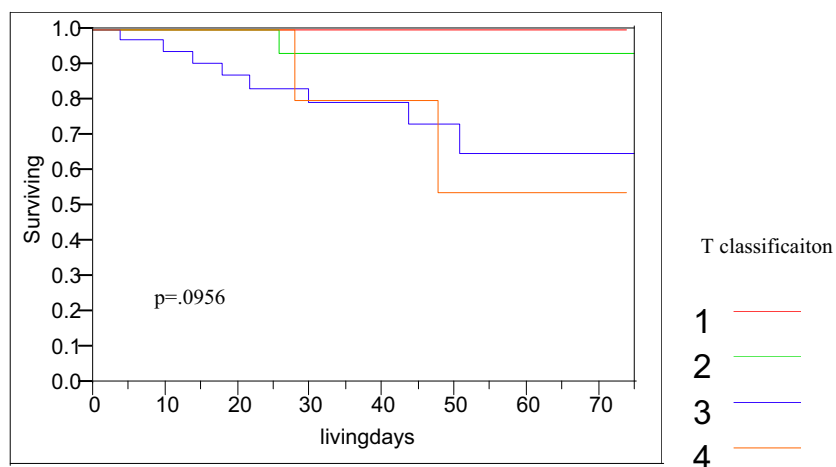


Fig. 3. Cumulative survival rates by tumor classification(T1, T2,T3 and T4).
Vertical axis, survival ; horizontal axis, months.



Fig 4 Cumulative survival rates by primary tumor volume

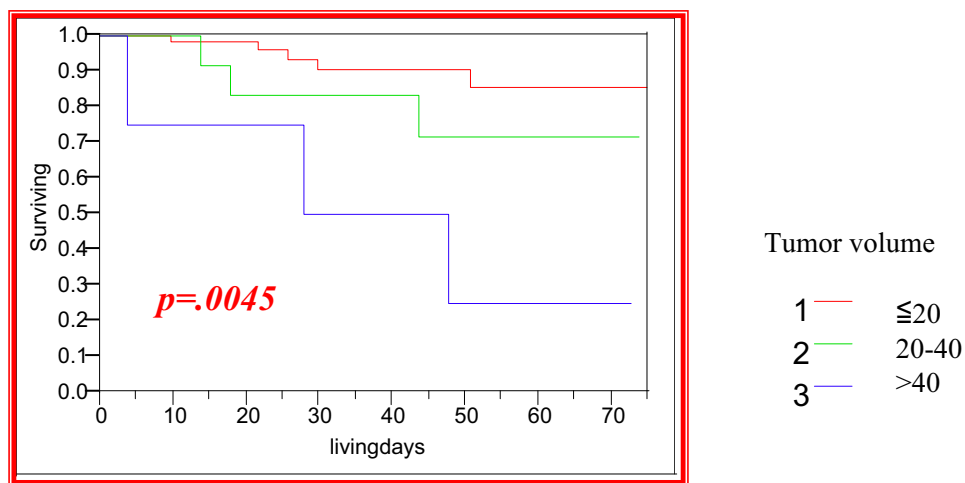
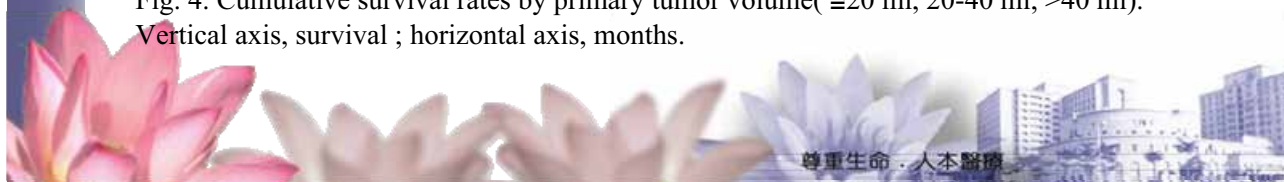


Fig. 4. Cumulative survival rates by primary tumor volume(≤ 20 ml, 20-40 ml, >40 ml).
Vertical axis, survival ; horizontal axis, months.





Cox proportional hazard ratio

Table 2. Cox proportional hazard model analysis adjusted for age, gender and chemotherapy status

Variables	RR	95% CI	P value
Primary tumor volume(>20ml)	5.704	1.047-28.058	0.0439
T4 stage	1.151	0.202-5.953	0.8668
N3 stage	2.149	0.514-8.591	0.2829

RR: risk ratio;95% CI: 95% confidence interval



Discussion:

- AJCC staging system is popular and widely accepted.
- Overlapping of tumor volume in different T was noted in Table 1.
- Maybe present staging system is not enough → They only focus on the two-dimensional structure!



- Neel and Taylor found AJCC staging in NPC is not suitable for prediction of survival.
- Chu et al. and Sze et al. found the importance of primary tumor volume in NPC → related to recurrence, survival
- Chen et al. pointed that primary tumor volume had better predictive value in survival after logic regression analysis.

- Measurement of primary tumor volume is no longer labor-intensive nor time-consuming
→ **Computer and image software make it simple!**
- Calculation of primary tumor volume and retropharyngeal LN can predict survival!
(Fig 4)



Conclusion:

- Calculation of primary tumor volume is no more time-consuming nor labor-extensive.
- Tumor volume in NPC is heterogeneous in concurrent T classification.



- Prediction of prognosis in NPC on the basis of tumor volume is favorable.
- Incorporation of PTV to TNM staging system may be suggested in the future.





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Thanks for your attention!

