

中高危DTC患者术后较高剂量¹³¹I治疗后疗效反应的影响因素分析

Therapeutic response outcomes and influencing factors after surgery and a higher does of ¹³¹I in patients with intermediate-to-high risk differentiated thyroid cancer

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·分化型甲状腺癌的¹³¹I治疗·中高危DTC患者术后较高剂量¹³¹I治疗后疗效反应的影响因素分析

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【摘要】目的 探讨无转移的中高危分化型甲状腺癌(DTC)患者术后给予较高剂量¹³¹I治疗的疗效及其影响因素。**方法** 回顾性分析2018年1月至2020年12月于山西医科大学第一医院行DTC全切术后的378例中高危DTC患者的临床资料, 其中男性103例、女性275例, 中位年龄45(13~85)岁。所有患者均在术后给予首次¹³¹I清甲和(或)辅助治疗, 剂量3.70~5.55 GBq。同时¹³¹I治疗前行术后残留甲状腺⁹⁹Tc^mO₄⁻显像, 治疗后2~7 d行¹³¹I治疗后全身显像(Rx-WBS)。所有患者在¹³¹I治疗后至少6个月进行随访, 中位随访时间16.3个月。依据2015年美国甲状腺协会(ATA)指南的疗效反应评估体系进行术后¹³¹I治疗疗效反应评估并分析影响因素。采用Spearman秩相关分析评估术后残留甲状腺⁹⁹Tc^mO₄⁻显像靶/非靶比值(T/NT)与Rx-WBS评分的相关性; 采用Mann-Whitney U检验、 χ^2 检验或Fisher确切概率法分析所有观察指标在疗效满意(ER)组与疗效欠佳(nER)组间的差异是否有统计学意义; 采用Logistic回归分析影响预后ER的独立危险因素, 并绘制ROC曲线, 获得最佳诊断临界值。**结果** ER组与nER组间在肿瘤最大径、术后刺激性甲状腺球蛋白(psTg)水平、N分期、术后与首次¹³¹I治疗间隔时间的差异均有统计学意义($Z=-7.127$ 、 -2.702 , Fisher确切概率法, $\chi^2=6.783$, 均 $P<0.05$); 年龄、性别、被膜受累、肿瘤多灶性、T分期、复发风险分层、首次¹³¹I治疗剂量、TSH水平、尿碘水平、甲状腺⁹⁹Tc^mO₄⁻显像半定量指标T/NT、¹³¹I Rx-WBS评分的差异均无统计学意义($Z=-1.505$ ~ -0.664 , $\chi^2=0.064$ ~ 5.501 , Fisher确切概率法, 均 $P>0.05$)。Spearman秩相关检验分析结果显示, ⁹⁹Tc^mO₄⁻显像T/NT与Rx-WBS显像评分呈中度相关($r=0.530$, $P<0.001$)。多因素Logistic回归分析结果显示, psTg水平是预后ER的独立危险因素。ROC曲线分析结果显示, psTg水平预测ER的最佳临界值为5.90 ng/ml、灵敏度为83.76%、特异度为59.81%。**结论** 给予较高剂量¹³¹I治疗的中高危DTC患者, 不论甲状腺⁹⁹Tc^mO₄⁻显像提示残留甲状腺多少均可以得到同样的ER比率; 且术后2个月内行首次¹³¹I治疗, 可能获得更好的治疗疗效。另外, psTg是预测无转移中高危DTC患者临床ER的独立危险因素。

【关键词】 放射性核素治疗; 碘放射性同位素; 甲状腺球蛋白; 分化型甲状腺癌; 疗效; 影响因素

DOI: [10.3760/cma.j.cn121381-202203002-00199](https://doi.org/10.3760/cma.j.cn121381-202203002-00199)**Therapeutic response outcomes and influencing factors after surgery and a higher dose of ¹³¹I in patients with intermediate-to-high risk differentiated thyroid cancer**

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【Abstract】 Objective To investigate the efficacy response and influencing factors of higher dose ¹³¹I in patients with metastasis-free intermediate-to-high risk differentiated thyroid cancer (DTC).

Methods The clinical data of 378 patients with intermediate-to-high risk DTC who attended in the First Hospital of Shanxi Medical University from January 2018 to December 2020 were retrospectively analyzed. The patients included 103 male and 275 female with a median age of 45(13–85) years. All patients were given the first ^{131}I remnant ablation and/or adjuvant therapy at a dose range of 3.70–5.55 GBq. Postoperative residual thyroid $^{99\text{m}}\text{TcO}_4^-$ image was performed before ^{131}I treatment, and ^{131}I post-treatment whole body scan (Rx-WBS) was performed 2–7 days after treatment. All patients were followed up at least 6 months with a median follow-up time of 16.3 months. The efficacy response evaluation system was evaluated according to the 2015 American Thyroid Association assessment system, and its influencing factors were analyzed. Spearman rank correlation analysis was used to evaluate the correlation between $^{99\text{m}}\text{TcO}_4^-$ image target/non-target (T/NT) ratio and Rx-WBS score. The Mann-Whitney U test, χ^2 test or Fisher's exact probability method was utilized to analyze whether the difference between the excellent response (ER) and non-excellent response (nER) groups was statistically significant for all observed indicators. Binary multivariate Logistic regression was used to analyze the independent influencing factors of prognostic ER, receiver operator characteristic (ROC) curves were utilized to obtain optimal diagnostic thresholds. **Results** Stistically significant differences were observed in maximum tumor diameter, postoperative stimulated thyroglobulin (psTg) level, N stage, and interval time between the two groups of ER and nER ($Z=-7.127, -2.702$, Fisher's exact probability method, $\chi^2=6.783$; all $P<0.05$). The differences were statistically insignificant for age, sex, capsule involvement, tumor multifocality, T-staging, risk of recurrence stratification, first dose of ^{131}I treatment, thyroid-stimulating hormone (TSH) level, urinary iodine level, $^{99\text{m}}\text{TcO}_4^-$ image T/NT values, and Rx-WBS score ($Z=-1.505$ to -0.664 , $\chi^2=0.064-5.501$, Fisher's exact probability method; all $P>0.05$). Spearman rank correlation analysis showed a moderate correlation between $^{99\text{m}}\text{TcO}_4^-$ image T/NT values and Rx-WBS imaging scores ($r=0.530, P<0.001$). A multivariate Logistic regression analysis showed that psTg level was the independent risk factor of ER. The ROC curve analysis showed that the optimal cut-off value of ER was 5.90 ng/ml, the sensitivity was 83.76%, and the specificity was 59.81%. **Conclusions** Patients with intermediate-to-high risk DTC treated with higher dose of ^{131}I had the same good ER proportion regardless of the amount of residual thyroid indicated by thyroid $^{99\text{m}}\text{TcO}_4^-$ imaging. Patients receiving ^{131}I treatment within 2 months after surgery may obtain better ER proportion. Meanwhile, psTg was an independent risk factor for predicting ER proportion in patients with metastasis-free intermediate-to-high risk DTC.

【 Key words 】 Radionuclide therapy; Iodine radioisotopes; Thyroglobulin; Differentiated thyroid cancer; Curative effect; Influence factor

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甲状腺癌是内分泌系统最常见的恶性肿瘤之一，其中 DTC 占 95% 以上。尽管甲状腺癌的发病率在逐年上升^[1-2]，但病死率并没有显著增加。对于 DTC 患者，关注的重点在于疾病的复发及无疾病生存期。2015 年美国甲状腺协会(American Thyroid Association, ATA)指南^[3]首次纳入了动态疗效反应评估体系，相关研究结果均表明，即使术后初始复发风险分层为中高危的 DTC 患者，在经过 ^{131}I 治疗后仍可以达到疗效满意(excellent response, ER)，且复发的风险降低^[4-5]。因此，了解影响中高危 DTC 患者的预后因素，在初始治疗时给予个体化治疗可以得到更好的疗效。本研究旨在分析中高危 DTC

患者术后行 ^{131}I 治疗后 ER 的影响因素，为其个体化治疗、早期疗效评价及随访策略的制定提供依据。

1 资料与方法

1.1 一般资料

回顾性分析 2018 年 1 月至 2020 年 12 月就诊于山西医科大学第一医院核医学科行 DTC 全切术后的 378 例中高危 DTC 患者的临床资料，其中男性 103 例、女性 275 例，中位年龄 45(13~85)岁，中位随访时间 16.3 个月。纳入标准：(1)均行甲状腺全切术，伴或不伴颈部淋巴结清扫术，术后组织病理学检查证实为 DTC；(2)术后首次行 ^{131}I 清甲治

疗和(或)辅助治疗;(3)随访时间 ≥ 6 个月,病历资料完整;(4)根据2015年版ATA指南^[3]复发风险分层评估为中高危DTC患者。排除标准:(1)病历资料不完整、失访的患者;(2)术后首次¹³¹I治疗行颈部超声、颈胸部CT或首次¹³¹I治疗后(post-treatment, Rx)全身显像(whole body scan, WBS)等提示有颈部淋巴结转移,或远处器官转移^[6]。

所有患者行¹³¹I治疗前均签署知情同意书。本研究符合《赫尔辛基宣言》的原则。

1.2 方法

1.2.1 ¹³¹I治疗及疗效评估

¹³¹I治疗前所有患者术后未用或停用甲状腺素治疗,同时保证低碘饮食2周,并行甲状腺⁹⁹Tc^mO₄⁻显像评估残留甲状腺的大小,同期测定术后刺激性甲状腺球蛋白(postoperative stimulated thyroglobulin, psTg)水平。参照2015年ATA指南^[3]给予患者¹³¹I清甲治疗和(或)辅助治疗,治疗剂量为3.70~5.55 GBq。¹³¹I治疗后2~7 d行Rx-WBS。首次¹³¹I治疗后至少6个月进行随访,随访内容包括生化指标[TSH、游离T₃、游离T₄、甲状腺球蛋白(thyroglobulin, Tg)和甲状腺球蛋白抗体(thyroglobulin antibody, TgAb)]及影像学检查(颈部超声、颈胸部CT,必要时行¹³¹I-WBS)。参照2015年版ATA指南^[3]提出的疗效反应评估体系进行术后¹³¹I治疗后疗效反应评估。(1)ER:血清抑制性Tg $< 0.2 \mu\text{g/L}$ 或刺激性Tg $< 1 \mu\text{g/L}$ (TgAb阴性),影像学结果阴性;(2)疗效不确切(indeterminate response, IDR): $0.2 \mu\text{g/L} \leq$ 抑制性Tg $< 1 \mu\text{g/L}$ (TgAb阴性)或 $1 \mu\text{g/L} \leq$ 刺激性Tg $< 10 \mu\text{g/L}$, TgAb稳定或下降;无影像学证实的结构或功能性疾病存在的证据,治疗后¹³¹I诊断性全身显像(diagnostic whole-body scan, Dx-WBS)示甲状腺床微弱显影;(3)生化疗效不佳(biochemical incomplete response, BIR):抑制性Tg $\geq 1 \mu\text{g/L}$ 或刺激性Tg $\geq 10 \mu\text{g/L}$ 或TgAb呈上升趋势,影像学结果阴性;(4)结构疗效不佳(structural incomplete response, SIR):Tg或TgAb呈任何水平;影像学结果存在可证实的结构或功能性疾病的证据。按¹³¹I治疗后的最终治疗后疗效反应评估结果将患者分为2组:ER组和疗效欠佳(non-excellent response, nER)组(包括IDR、BIR和SIR)。

1.2.2 术后残留甲状腺核素显像

术后患者行残留甲状腺⁹⁹Tc^mO₄⁻显像,根据显

像结果分别勾画残留甲状腺和本底的ROI,获取T/NT。所有ROI勾画均由1名有10年以上工作经验的核医学科医师完成,分别勾画3次,取3次测量值的平均值。¹³¹I Rx-WBS的图像经后处理,参考Giannoula等^[7]提出的¹³¹I Rx-WBS评分系统进行评估,评估分值为0~5分。0分为无摄取(颈部甲状腺床未见摄¹³¹I灶);1分为轻度摄取(颈部甲状腺床仅见1处轻微摄¹³¹I灶);2分为中度摄取(颈部甲状腺床见2处明显摄¹³¹I灶);3分为高度摄取(颈部甲状腺床见3处及以上明显摄¹³¹I灶);4分为“星芒状”摄取;5分为远处转移。本研究不包括评分为5分的远处转移患者。

1.2.3 术后与首次¹³¹I治疗的间隔时间对ER的预测价值

考虑到临床上多数DTC患者术后行甲状腺素替代治疗1个月后需先复查,再停用甲状腺素进行¹³¹I治疗,因此,以术后首次¹³¹I治疗的间隔时间2个月为临界值对DTC患者进行ER分析。

1.2.4 统计学分析

应用SPSS 26.0软件进行统计学分析。偏态分布的连续变量以 $M(Q_1, Q_3)$ 表示,计数资料以例(百分比)表示。Spearman秩相关分析评估术后残留甲状腺⁹⁹Tc^mO₄⁻显像T/NT与¹³¹I Rx-WBS残留甲状腺评分的相关性。采用Mann-Whitney U检验、 χ^2 检验或Fisher确切概率法分析所有观察指标在ER组和nER组间的差异是否有统计学意义,将有统计学意义的指标纳入二元多因素Logistic回归分析,分析影响预后ER的独立危险因素,并绘制ROC曲线,获得最佳诊断临界值。 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 DTC患者临床资料

参照美国癌症联合委员会甲状腺癌TNM分期(第8版)标准^[8]对患者进行分期,其中原发灶Tx期24例、T1期199例、T2期34例、T3期90例、T4期31例;淋巴结转移Nx期17例、N0期18例、N1a期198例、N1b期145例。依据ATA指南(2015版)^[3]提出的复发风险分层分为中危321例、高危57例。疗效反应评估结果显示,ER组患者271例,nER组患者107例(包括IDR61例、BIR36例、SIR10例)。其他临床资料和组织病理

学资料见表1。

2.2 预后 ER 的影响因素分析

Spearman 秩相关分析结果显示, 术后残留甲状腺⁹⁹Tc^mO₄⁻显像 T/NT 值与¹³¹I Rx-WBS 显像评分

呈中度相关($r=0.530, P<0.001$)。

ER 组与 nER 组间的肿瘤最大径、psTg 水平、N 分期、术后与首次¹³¹I 治疗的间隔时间的差异均有统计学意义(均 $P<0.05$); 年龄、性别、被

表1 378 例中高危 DTC 患者的临床资料和组织病理学资料的比较

Table 1 Comparison of clinical data and histopathological pathological data in 378 patients with intermediate-to-high risk differentiated thyroid cancer

因素	疗效满意组(n=271)	疗效欠佳组(n=107)	检验值	P值
年龄[M(Q ₁ , Q ₃), 岁]	45(35, 52)	45(34, 51)	Z=-0.699	0.484
肿瘤最大径[M(Q ₁ , Q ₃), cm]	1.2(0.9, 2.0)	1.5(1.0, 2.5)	Z=-2.702	0.007
性别[例(%)]			$\chi^2=0.224$	0.636
男	72(26.6)	31(29.0)		
女	199(73.4)	76(71.0)		
被膜受累[例(%)]			$\chi^2=0.064$	0.800
否	191(70.5)	74(69.2)		
是	80(29.5)	33(30.8)		
肿瘤多灶性[例(%)]			$\chi^2=0.358$	0.550
单灶	90(33.2)	39(36.4)		
多灶	181(66.8)	68(63.6)		
T分期[例(%)]			$\chi^2=5.501$	0.240
Tx期	18(6.6)	6(5.6)		
T1期	151(55.7)	48(44.9)		
T2期	21(7.8)	13(12.1)		
T3期	62(22.9)	28(26.2)		
T4期	19(7.0)	12(11.2)		
N分期[例(%)]			-	0.005
Nx期	14(5.1)	3(2.8)		
N0期	17(6.3)	1(0.9)		
N1a期	149(55.0)	49(45.8)		
N1b期	91(33.6)	54(50.5)		
复发风险分层[例(%)]			$\chi^2=3.502$	0.061
中危	236(87.1)	85(79.4)		
高危	35(12.9)	22(20.6)		
首次 ¹³¹ I治疗剂量[M(Q ₁ , Q ₃), GBq]	3.7(3.7, 3.7)	3.7(3.7, 3.7)	Z=-1.505	0.132
psTg水平[M(Q ₁ , Q ₃), ng/ml]	1.36(0.22, 4.28)	8.98(1.56, 21.32)	Z=-7.127	<0.001
TSH水平[M(Q ₁ , Q ₃), mIU/L]	126.82(86.23, 150.00)	127.77(91.89, 150.00)	Z=-0.664	0.506
尿碘[M(Q ₁ , Q ₃), μ g/L]	109.70(73.10, 181.00)	125.70(81.65, 210.05)	Z=-1.005	0.314
甲状腺 ⁹⁹ Tc ^m O ₄ ⁻ 显像T/NT[M(Q ₁ , Q ₃)]	1.47(1.10, 2.49)	1.60(1.20, 2.68)	Z=-0.940	0.345
¹³¹ I Rx-WBS评分[例(%)]			-	0.415
0分	2(0.7)	1(0.9)		
1分	22(8.1)	7(6.5)		
2分	105(38.8)	48(44.9)		
3分	89(32.8)	38(35.5)		
4分	53(19.6)	13(12.2)		
术后与首次 ¹³¹ I治疗的间隔时间[例(%)]			$\chi^2=6.783$	0.009
\leq 2个月	139(51.3)	39(36.4)		
$>$ 2个月	132(48.7)	68(63.6)		

注: DTC 为分化型甲状腺癌; Tx 为原发肿瘤无法评估; Nx 为淋巴结转移无法评估; psTg 为术后刺激性甲状腺球蛋白; TSH 为促甲状腺激素; T/NT 为靶/非靶比值; Rx-WBS 为治疗性全身显像。-为 Fisher 确切概率法, 无检验值

膜受累、肿瘤多灶性、T分期、复发风险分层、首次¹³¹I治疗剂量、TSH水平、尿碘水平、甲状腺⁹⁹Tc^mO₄⁻显像 T/NT、¹³¹I Rx-WBS 评分指标的差异均无统计学意义(均 $P>0.05$)。

多因素 Logistic 回归分析结果显示, psTg 为 ER 的独立危险因素 ($OR=0.981$, $95\%CI=0.849\sim 0.923$, $P<0.001$, 表 2)。ROC 曲线分析结果显示, psTg 水平预测 ER 的最佳诊断临界值为 5.90 ng/ml、灵敏度为 83.76%、特异度为 59.81%、AUC 为 0.735 (图 1)。

3 讨论

中高危 DTC 患者术后首次评估初始复发的风险较高, 但经过手术及首次¹³¹I 治疗后总体病死率

表 2 影响中高危 DTC 患者¹³¹I 治疗预后的多因素 Logistic 回归分析

Table 2 The multivariate Logistic regression analysis of prognostic factors in patients with intermediate-to-high risk DTC after ¹³¹I treatment

预后因素	β 值	OR值	95%CI	P值
术后与首次 ¹³¹ I治疗时间间隔	0.960	2.611	0.856~7.966	0.092
肿瘤最大径	-0.020	0.981	0.765~1.258	0.878
psTg水平	-1.222	0.885	0.849~0.923	<0.001
N分期	-	-	-	0.310

注: DTC 为分化型甲状腺癌; CI 为置信区间; psTg 为术后刺激性甲状腺球蛋白; -表示无此项数据

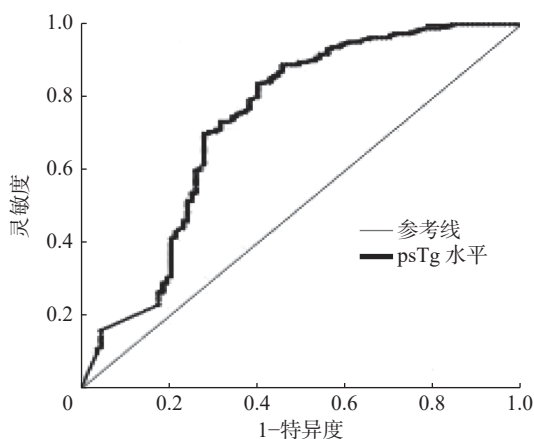


图 1 psTg 预测中高危 DTC 患者疗效满意的受试者工作特征曲线 psTg 为术后刺激性甲状腺球蛋白; DTC 为分化型甲状腺癌

Figure 1 Receiver operating characteristic curve of post-operative stimulated thyroglobulin predicting excellent response in patients with intermediate-to-high risk differentiated thyroid carcinoma

及无瘤生存期均有明显改善^[3,9]。无肉眼可见转移的中高危 DTC 患者术后行¹³¹I 清甲治疗或辅助治疗, 有利于后期随访进行血清 Tg 水平的分层和病情监测, 辅助治疗还有助于清除隐匿的、潜在的 DTC 病灶, 提高无瘤生存率^[4]。本研究结果表明, 术后无转移的中高危患者在经过手术及首次¹³¹I 治疗后, 末期随访中 4 种疗效反应(ER、IDR、BIR、SIR)均有可能出现, 其中有 71.7%(271/378)患者达到 ER。因此, 了解中高危 DTC 患者¹³¹I 治疗后获得 ER 的影响因素, 需在行首次¹³¹I 治疗前进行评估, 筛选预后可能较差的患者, 适当增加¹³¹I 剂量并调整 TSH 抑制治疗目标, 进行个体化治疗并优化随访方案。

国内外多项针对低中危 DTC 患者的研究结果证实了甲状腺⁹⁹Tc^mO₄⁻显像对于¹³¹I 清甲疗效有预测价值。Wei 等^[6]发现, 甲状腺⁹⁹Tc^mO₄⁻显像阴性的低中危 DTC 患者中, 有 80.68%(71/88)的患者达到了 ER, 且⁹⁹Tc^mO₄⁻显像可较好地预测¹³¹I 治疗疗效。其中, 甲状腺⁹⁹Tc^mO₄⁻显像阴性是清甲成功的最佳预测指标, ⁹⁹Tc^mO₄⁻摄取率<0.9% 可较好地预测清甲成功率^[10], ⁹⁹Tc^mO₄⁻摄取率>1.4%则预示着有清甲失败的风险^[11]。但也有研究者认为, ⁹⁹Tc^mO₄⁻定量分析不能预测¹³¹I 清甲效果^[12]。锝和碘属于同族元素, 有研究表明, 术后甲状腺⁹⁹Tc^mO₄⁻显像阳性提示¹³¹I Rx-WBS 存在“星芒状”残留甲状腺的可能性大^[13]。Xiao 等^[13]发现, 当 psTg 水平>10 ng/ml 时, 存在“星芒状”残留甲状腺的患者有更好的治疗反应。但也有研究表明, 当 psTg 水平≤2 ng/ml 时, “星芒状”残留甲状腺的患者行第 2 次¹³¹I-WBS 阴性率更高, 在中位随访时间 8 年的随访中患者的无复发生存期更长; 然而, 当 psTg 水平>2 ng/ml 时, “星芒状”残留甲状腺对清甲成功率及无复发生存期的预测价值有限^[14]。本研究结果显示, 中高危 DTC 患者甲状腺⁹⁹Tc^mO₄⁻核素显像对预后 ER 均无预测价值, 但是术后残留甲状腺⁹⁹Tc^mO₄⁻显像 T/NT 值与¹³¹I-Rx-WBS 显像评分呈中度相关, 这表明通过甲状腺⁹⁹Tc^mO₄⁻显像可以间接预测¹³¹I Rx-WBS 显像的结果。

¹³¹I 治疗是甲状腺癌患者术后治疗的重要手段之一, 在中高危 DTC 患者中, ¹³¹I 治疗可降低疾病的复发率及病死率, 改善预后。然而由于医疗资源有限及术前含碘造影剂的使用等因素影响, 患者需

要等待数周至数月才能接受¹³¹I治疗。手术与首次¹³¹I治疗间隔时间对DTC患者预后的影响争议较大,各版指南均未给出具体的间隔时间。多数研究结果显示,首次¹³¹I治疗的时间对高危DTC患者的总生存期及复发风险均无影响^[15-18]。Simsek等^[19]的研究结果表明,高危DTC患者延迟58 d行首次¹³¹I治疗,SIR风险升高2.78倍。Higashi等^[20]认为,对于高危DTC患者延迟6个月行首次¹³¹I治疗,其死亡风险是早期治疗的4.22倍。因此,对于高危患者而言,尽管首次¹³¹I治疗时间不影响患者的总生存期及复发风险,但是早期行¹³¹I治疗可以获得更高的ER比率及较低SIR比率,降低死亡风险。延迟行首次¹³¹I治疗对低中危DTC患者的疗效争议较大,多数研究提出延迟3~6个月行首次¹³¹I治疗并不会降低无病生存期及总生存期^[15,21-22]。Krajewska等^[17]的研究结果表明,低危DTC患者尽早行¹³¹I治疗可降低复发风险。一项针对我国低中危DTC患者的回顾性研究结果显示,延迟3个月以上接受首次¹³¹I治疗的患者BIR和SIR的风险升高3.771倍^[23]。然而Simsek等^[19]的研究结果表明,对低中危DTC患者延迟3个月行首次¹³¹I治疗并不会增加SIR的比率。本研究结果表明,在271例ER的患者中,2个月以及内行首次¹³¹I治疗的患者比率高于2个月以上延迟治疗的患者(51.3%对48.7%),这可能与本研究涉及高危DTC患者术中出现肉眼可见的血管或喉返神经黏连、或存在潜在隐匿的病灶等因素有关,短时间内病情可能变化不大,但是随着时间的推移,其病情进展的概率增加^[24]。

Tg是一种由甲状腺滤泡上皮细胞分泌的特异性蛋白,分化程度较好的DTC细胞Tg分泌活跃,因此,Tg成为¹³¹I治疗后随访中的一种灵敏度及特异度都较高的肿瘤标志物。尽管首次¹³¹I治疗前psTg水平受到残留甲状腺的影响,但psTg水平及随访中Tg水平的动态变化已被证实对中高危DTC患者预后有良好的预测价值。陈鹏等^[25]的研究结果显示,预测肿瘤转移的psTg临界值为40.6 ng/ml。有研究结果显示,SIR和BIR的风险会随着psTg水平的升高而增加^[26-27]。Klain等^[28]对606例DTC患者进行中位随访时间105个月的长期随访,发现psTg水平>10 ng/ml是影响预后ER的独立危险因素。我国的一项纳入479例DTC患者的研究结果显示,psTg水平<9.51 ng/ml是预

测首次¹³¹I治疗后短期疗效达到满意的最佳临界值^[29]。周倩等^[9]对256例高危DTC患者进行随访分析,结果显示,预测ER的psTg临界值为5.38 ng/ml,这与本研究得出的结果接近。尽管多项研究得出了不同的psTg临界值,但仍可以得出相同的结论:DTC患者无论初始复发风险分层高低,较低的psTg水平都可以获得较好的预后及较低的复发及转移风险,针对这部分患者,首次¹³¹I治疗给予常规剂量可以减少¹³¹I引起的不良反应及患者的心理负担;相反,psTg水平较高提示可能存在淋巴结或远处转移,有较高的复发及转移风险,在首次¹³¹I治疗时可以酌情增加¹³¹I治疗的剂量,以获得较好的预后,降低复发及转移的风险。

综上所述,甲状腺^{99m}TcO₄⁻显像半定量指标T/Nt与¹³¹I Rx-WBS显像评分呈中度相关。对于中高危及DTC患者,¹³¹I治疗前无论术后残留甲状腺多少,给予较高剂量¹³¹I治疗,均可以得到同样的ER比率。术后2个月内行¹³¹I治疗,可能获得更好的疗效。psTg水平是中高危DTC患者预后的独立危险因素,psTg水平<5.90 ng/ml的DTC患者初始治疗后达到ER的比率较高。

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