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· 临床研究 ·

阶段式康复训练法改善颈部淋巴清扫术后患者肩综合征的效果评价

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【摘要】目的 探讨阶段式康复训练改善颈部淋巴清扫术后患者肩综合征的效果, 为患者术后肩关节功能恢复提供有效方案。**方法** 本研究已通过单位伦理委员会审查批准, 并获得患者知情同意。制定颈部淋巴清扫术后肩部阶段式康复训练计划, 选取中山大学附属口腔医院2020年12月至2021年4月符合纳入标准的患者70例, 随机分成试验组和对照组(每组各35例)。对照组进行常规术后护理, 主要包括术后6周开始进行肩关节活动训练、协调性训练和颈部小范围活动训练等运动康复训练至术后12个月; 试验组则在常规术后护理的基础上, 增加术前、术后全麻清醒至拆线、拆线至术后6周、术后6周至12个月4个阶段渐进性开展术前熟悉手法训练、术后保护性康复训练、运动型康复训练、抗阻训练等阶段式康复训练计划。两组受试者训练频率均为至少3次/周, 每次训练时长为10~15 min, 锻炼强度为Borg自觉运动强度分级2~3分(即轻度到中度的呼吸急促或疲劳), 并分别在术前、术后3个月、术后6个月、术后12个月使用淋巴清扫损伤指数(neck dissection impairment index, NDII)评估其肩关节功能相关生活质量, 分数越高表示生活质量越高。**结果** 试验组28例和对照组32例完成了1年的随访。在术后3、6个月, 试验组受试者的NDII显著高于对照组[术后3个月: 试验组(93.48 ± 9.36) vs. 对照组(80.00 ± 11.34) ($P < 0.001$), 术后6个月: 试验组(98.21 ± 4.76) vs. 对照组(90.70 ± 9.12) ($P < 0.001$); 术后12个月, 试验组受试者的NDII(97.23 ± 4.88)仍高于对照组(96.33 ± 4.49), 但是差异无统计学意义($P = 0.458$)。两组受试者在术后3、6、12个月3个时间点的组内NDII得分比较, 差异均具有统计学意义($P < 0.001$)。**结论** 阶段式康复训练法在颈部淋巴清扫术患者中应用具有可行性, 有助于加速患者术后6个月内肩关节功能及生活质量的恢复。

【关键词】 颈部淋巴清扫; 肩关节; 肩综合征; 康复; 生活质量; 护理; 头颈肿瘤; 抗阻训练; 运动康复

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Evaluation of the effectiveness of a phased rehabilitation training programme to relieve shoulder dysfunction in patients after neck dissection DENG Yijun^{1,2}, ZHANG Tingbi³, GU Wenzhen^{1,2}, HE Xingfang^{1,2}, WU Weiqin^{1,2}, WANG Shuai^{1,2}, XIONG Caibing^{1,2}, ZHAO Yanqiong^{1,2}, WEI Ying^{1,2}, DENG Yadong^{1,2}, HUANG Qiuyu^{1,2}. 1. Hospital of Stomatology, Sun Yat-sen University, Guangzhou 510055, China; 2. Guangdong Provincial Clinical Research Center of Oral Diseases, Guangzhou 510055, China; 3. Guangzhou First People's Hospital, Guangzhou 510180, China

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【Abstract】Objective To explore the effect of a phased rehabilitation training programme to relieve shoulder dysfunction in patients after neck dissection and to provide effective solutions for postoperative shoulder joint function recovery.

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ery of patients. **Methods** This study has been reviewed and approved by the Ethics Committee, and informed consent has been obtained from patients. A phased rehabilitation training programme for the shoulder after neck dessection was developed through literature review and discussion, and 70 eligible patients from Hospital of Stomatology, Sun Yat-sen University from December 2020 to April 2021 were selected and randomly divided into the test group and control group (35 patients in each group). The control group underwent motor rehabilitation training from 6 weeks postoperative to 1 year after surgery, such as shoulder mobility and coordination training and small range of motion training of the neck, while the test group took part in a rehabilitation training program that included familiarization maneuver training, protective rehabilitation, exercise rehabilitation, and resistance training in the following four stages: preoperative, postoperative general anesthesia and awake until the removal of stitches, the removal of stitches until 6 weeks after surgery, and 6 weeks after surgery until 1 year after surgery. The frequency of training in both groups was at least 3 days per week, and the length of each training session was 10-15 min. The intensity of exercise was 2-3 points on the Borg Conscious Exercise Intensity Scale (i.e., mild-to-moderate tachypnea or fatigue). The neck dissection injury index (NDII) was used to evaluate the quality of life related to shoulder joint function at four time points: preoperative, postoperative 3 months, postoperative 6 months, and postoperative 12 months. The higher the score, the better the quality of life. **Results** 28 cases in the test group and 32 cases in the control group completed a one-year follow-up. At 3 and 6 months postoperative, the NDII of the test group was significantly higher than that of the control group [3 months postoperative: test group (93.48 ± 9.36) vs. control group (80.00 ± 11.34) ($P < 0.001$), 6 months postoperative: test group (98.21 ± 4.76) vs. control group (90.70 ± 9.12) ($P < 0.001$); 12 months after surgery, the NDII of the test group (97.23 ± 4.88) was still higher than that of the control group (96.33 ± 4.49), but the difference was not statistically significant ($P = 0.458$). The difference in NDII scores among subjects at 3, 6, and 12 months after surgery was statistically significant in each group ($P < 0.001$). **Conclusion** The application of the phased rehabilitation training method in neck dissection patients has a feasibility and could improve the quality of life of patients' shoulder joint function within 6 months after surgery.

【Key words】 neck dissection; shoulder joint; shoulder syndrome; rehabilitation; quality of life; nursing; head and neck tumour; resistance training; exercise rehabilitation

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头颈部是肿瘤高发部位之一,包括腮腺肿瘤、口腔癌、口咽癌、鼻咽癌、喉癌、甲状腺癌等,位居全身肿瘤发病率前十^[1-2]。颈部淋巴转移是头颈部癌细胞重要转移方式。因此对于怀疑有颈部转移的头颈癌患者,需行颈部淋巴清扫术清除颈部受累的淋巴组织,以达到根治的目的^[3]。由于颈部淋巴清扫术清扫深度达到了颈深筋膜浅层,使镶嵌其中的副神经受到牵拉,甚至被切断或切除^[4],导致一侧的脊副神经损伤会使同侧转头及抬肩无力^[5]。研究表明颈部清扫损伤脊副神经,是导致患者肩关节疼痛和功能障碍的重要原因之一^[6-7]。阶段性康复训练旨在促进神经恢复、增加斜方肌和肩胛肌的力量,循序渐进地帮助缓解颈清术对肩关节功能的影响^[8-9]。研究显示没有断裂或重新缝合的神经损伤仍有恢复的潜力,但由于神经恢复过程相对较慢,轴突损伤后的康复锻炼至少需要维持3个月才产生一些影响^[10],因此康复训练需要长时间的坚持和跟踪随访。本研究拟建立一套阶

段式肩关节功能康复干预模式,从患者术前开始宣教,将锻炼计划融入术前、术后早期、康复期,循序渐进地增强患者的锻炼意识,并设计了两组患者进行随机对照,充分跟踪随访12个月,拟探讨阶段性康复训练法的可行性和有效性,为临床工作提供参考依据。

1 研究对象与方法

1.1 纳入与排除标准

选取2020年12月至2021年4月在中山大学附属口腔医院住院治疗的患者。纳入标准:①自愿知情同意者;②手术方式含颈部淋巴清扫术,并在术中保留副神经;③术前未接受其他抗肿瘤治疗(如放疗、化疗)者;④能用普通话或粤语进行交流。排除标准:①上肢功能瘫痪,或有肩周炎、风湿等影响肩部活动的疾病;②合并严重的心、肺、脑、肾功能障碍,不能承担训练负荷者;③有任何其他类型的癌症。剔除标准:①患者随访期复发

或死亡;②患者主动要求退出试验;③随访期间内患者失访。

1.2 评估工具

淋巴清扫损伤指数(neck dissection impairment index, NDII)是用于评估头颈肿瘤患者颈部淋巴清扫术后的生活质量的量表^[11],是在病人访谈后,外科医生、康复治疗师和统计学专家进行筛选得到的问卷,是唯一专门开发用于颈部淋巴清扫术后肩关节功能评估,并广泛应用于颈部淋巴清扫术后肩关节功能评估^[12-13]。该量表一共有10个项目,其内容包括肩部和颈部相关的疼痛和僵硬感、自我照护,以及社交活动、娱乐活动和工作的参与情况。该量表为自评量表,回顾期为4周,问卷约5 min可以完成,题目较简单。每题提供0~5分的选项(0分最差,5分最好),最后将(问卷总分-10)÷40×100=NDII分数,分数越高表示生活质量越高。内部一致性方面,Cronbach's α 值为0.92~0.93,重测试验总得分的Spearman相关系数为0.91,各项目相关系数范围为0.41~1.00^[12-13]。

1.3 样本量计算

本研究以NDII作为样本量计算的指标,假设发生一类错误概率为5%,二类错误的概率为20%(80%功效),两组样本比例为Q1:Q2=0.5:0.5,检验方法为两个独立样本的双侧检验。计算公式^[14]如下:

$$N1=N2[(Z_{1-\alpha/2}+Z_{1-\beta})\times\sigma/\delta]^2\times[(r+1)/r]$$

该公式中 α 为一类错误概率, β 为二类错误概率, σ 为总体标准差, δ 为两总体均数差, r 为两样本量的比值。根据以往使用NDII的研究^[15],研究前后均数分别为93.41和82.50,标准差分别为2.35和4.58, $\delta=10.4$,可得出每组需要样本量为29例,失访率按20%计算,观察组和对照组各需要35例。本研究样本量设置为70例,每组各35例,可进行有效检验。

1.4 研究方法

1.4.1 分组方法 随机数字表法70个随机数,对应患者入组序号,将随机数从大到小排列,R1~35为干预组,R36~70为对照组,再按照入组序号排列,对应患者安排手术时间,按前后顺序入组对应相应的序号,从而随机分配到试验组和对照组。本项目已获得中山大学附属口腔医院伦理委员会审批(批件号:KQEC-2020-57-01)。

1.4.2 常规护理 两组患者均接受常规护理持续至术后12个月,包括手术前相关指导、术后伤口护

理、术后6周后医师远程指导肩部运动康复训练。其中肩部运动康复训练包括患侧手臂爬墙运动、肩关节前屈和后伸运动、协调性训练和颈部小范围活动训练,频率为至少3次/周,每次训练时长为10~15 min,锻炼强度为Borg自觉运动强度分级2~3分(即轻到中度的呼吸急促或疲劳)^[16]。

1.4.3 肩关节阶段式康复训练法 试验组则在常规护理的基础上,增加阶段式康复训练,频率为至少3次/周,每次训练时长为10~15 min,锻炼强度为Borg自觉运动强度分级2~3分(即轻到中度的呼吸急促或疲劳)^[16]。分阶段康复训练法是经过护理、康复人员、外科医生组成研究小组查阅文献、开展研究讨论后制定的适合口腔颌面-头颈肿瘤患者颈部淋巴清扫术后颈肩部锻炼方法,分4个阶段进行(详见图1)。为保障受试者出院后能顺利完成康复训练,工作人员在出院前建立微信群组平台,将患者和相关医护人员邀请进入该群组,维护负责平台,并将锻炼方法和注意事项制作成小视频、文字、图片等,以微信公众号的形式每月推送相关信息。

1.4.4 出院后随访 研究人员在术前、术后3个月、6个月、1年进行随访评估,随访方式包括门诊随访、电话随访、微信平台线上随访等。随访3次以上(单次随访至少尝试2次,每次间隔2 d以上)联系不上患者,则视为失访。

1.5 统计学分析

采用SPSS 25.0进行统计分析,计数资料使用频数进行描述,使用pearson卡方检验,有单元格 $>1 < 5$ 时使用连续校正卡方检验,有单元格 <1 使用Fisher精确卡方检验,计量资料使用均数和标准差描述。使用广义线性方程计算分组、测量时间主效应,以及两者的交互效应。使用两个独立样本 t 检验进行统计检验,分析不同测量时间点的单独效应;使用广义线性方程分析不同分组时间单独效应。检验水准 $\alpha = 0.05$ 。

2 结果

2.1 患者基本资料

在2020年12月至2021年4月总共有1483例住院患者,其中口腔恶性肿瘤186例,行颈部淋巴清扫的患者82例,有70例患者满足纳入标准并通过排除标准后入组,随机分成试验组和对照组(各35例),在随后1年的随访中试验组死亡2例、复发3例、失访2例,对照组死亡1例、复发2例,最终试验

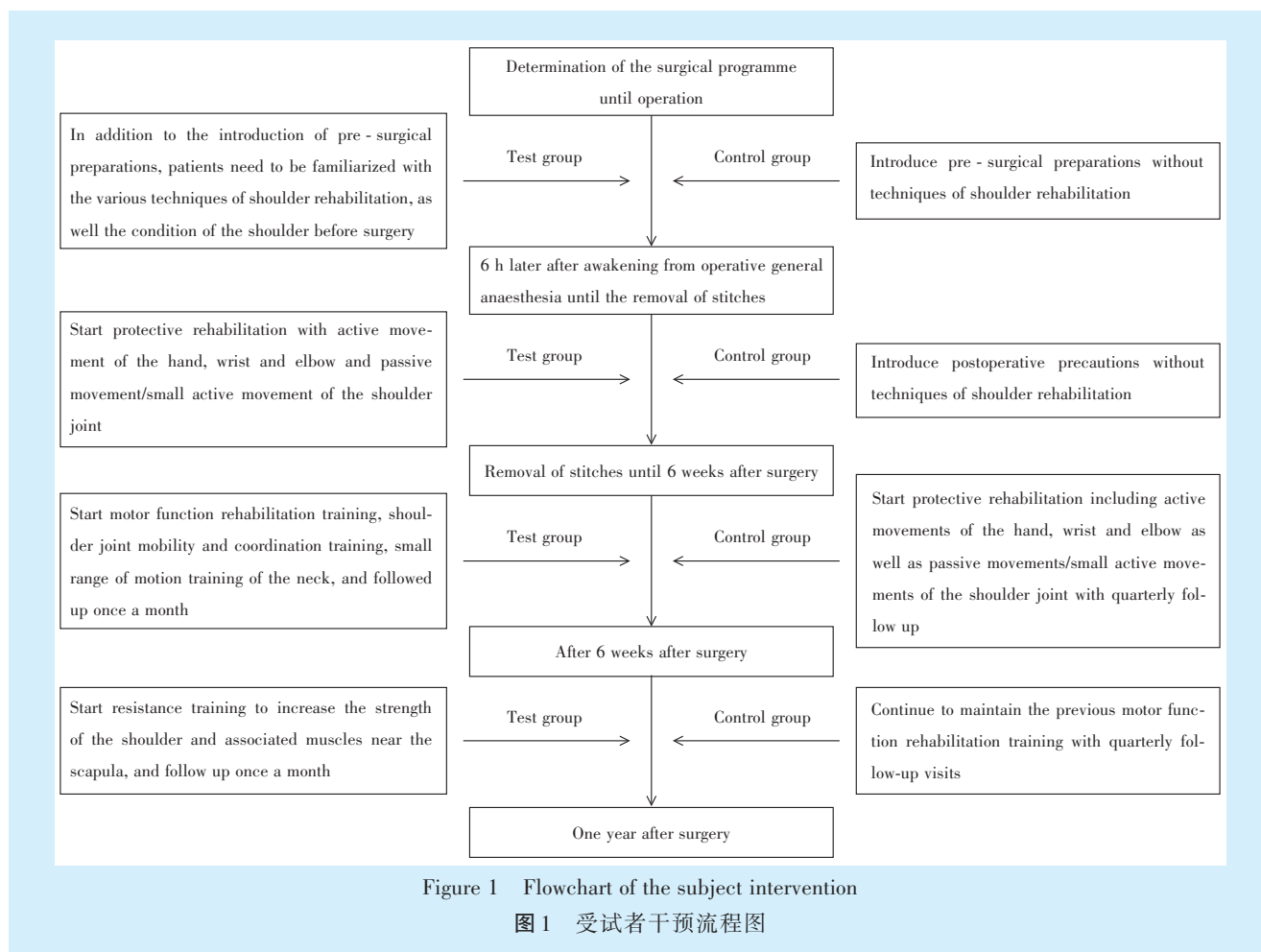


Figure 1 Flowchart of the subject intervention

图1 受试者干预流程图

组 28 例、对照组 32 例受试者完成随访(详见图 2)。

入组受试者的平均年龄为(50.05 ± 11.34)岁, 男性 36 例(50%), 颈部淋巴清扫范围以 I ~ III 区居多(50%), 其次是 I ~ II 区 22 例(30.56%), 65.28% 接受了单侧颈部淋巴清扫, 68.06% 接受了皮瓣血管化游离移植修复, 29.17% 接受了术后放疗。两组患者的一般资料差异无统计学意义($P < 0.05$), 基线数据具有可比性(见表 1)。

2.2 广义线性模型效应分析结果

虽然两组年龄、性别、颈部淋巴清扫范围、手术方式、术后放化疗无明显统计学差异, 但文献报道清扫范围、颈清位置、术后放疗、皮瓣修复对患者肩关节功能相关生活质量影响较大, 本研究仍将清扫范围、颈清位置、术后放疗、皮瓣修复、术后其他功能锻炼列为协变量固定值以减少系统误差, 以 NDII 为因变量, 使用广义估计方程分析分组和测量时间主效应, 以及分组与测量时间的交互效应, 结果显示总方程(Wald $\chi^2 = 111.225, P < 0.001$), 分组主效应(Wald $\chi^2 = 21.872, P < 0.001$)和测量时间主效应(Wald $\chi^2 = 103.656, P < 0.001$),

并且分组与测量时间交互效应也存在统计学意义(Wald $\chi^2 = 34.255, P < 0.001$), 提示应进一步探索分组和测量时间的单独效应(见表 2)。

2.3 单独效应分析结果

2.3.1 分组单独效应 术前所有受试者 NDII 均为 100 分。试验组 NDII 在术后 3 个月和术后 6 个月高于对照组[术后 3 个月试验组 vs. 对照组:(93.48 ± 9.36) vs. (80.00 ± 11.34), 术后 6 个月试验组 vs. 对照组(98.21 ± 4.76) vs. (90.70 ± 9.12)]($P < 0.001$)。术后 12 个月, 试验组 NDII 仍高于对照组[试验组(97.23 ± 4.88) vs. 对照组(96.33 ± 4.49)], 但是差异无统计学意义($P = 0.458$)(见表 3)。

试验组患者在术后 3 个月肩关节外展和前屈功能优于对照组(见图 3)。试验组患者 1, 因“左舌鳞状细胞癌”行“左舌肿物扩大切除+双侧颈部淋巴清扫+左股前外侧瓣”, 术后 3 个月最大限度外展和前屈双侧上臂可触及同侧耳朵, 后伸活动范围良好。对照组患者 1, 因“口底鳞状细胞癌”行“口底肿物扩大切除+双侧颈部淋巴清扫+左股前外侧瓣”, 术后 3 个月最大限度外展和前屈上臂无法触

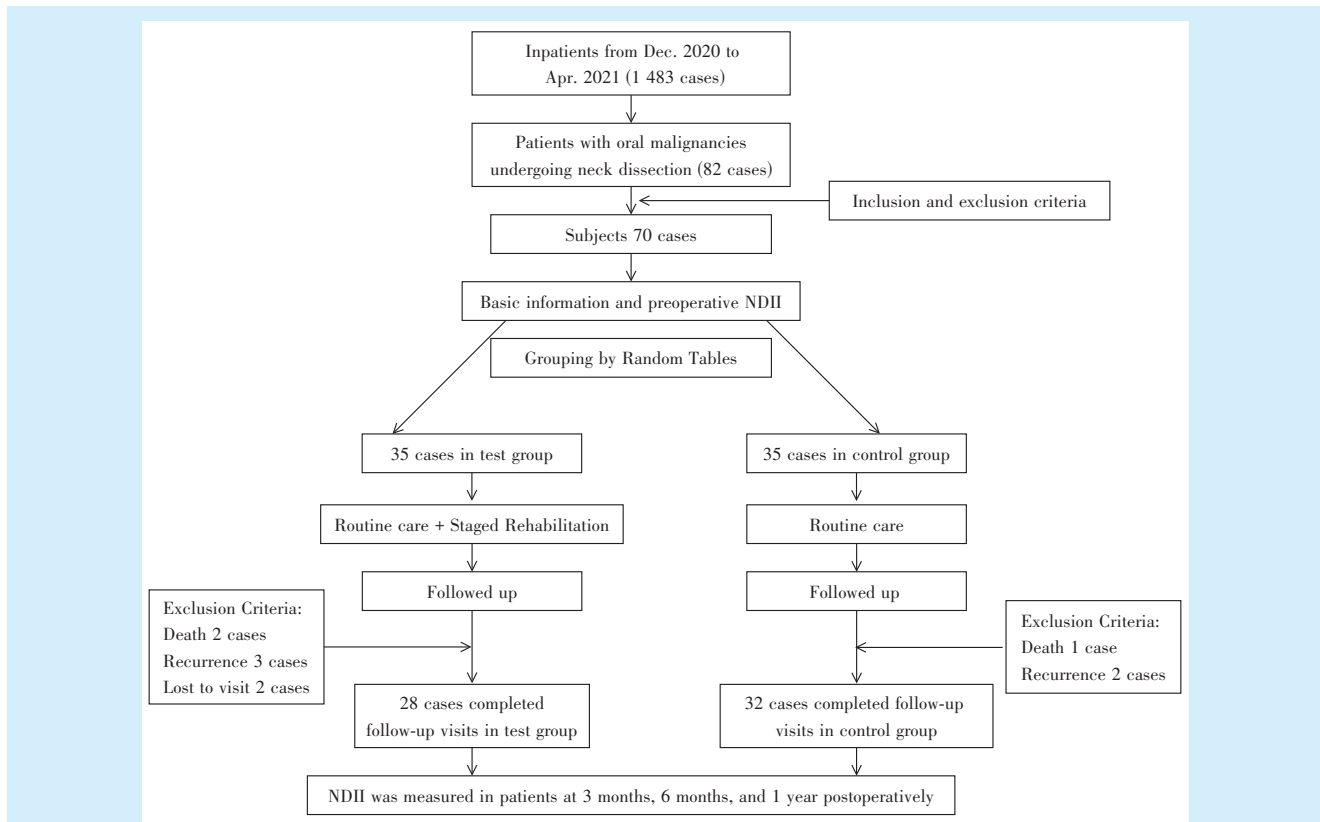


Figure 2 Subject enrollment process

图2 受试者入组过程一览表

表1 受试者基本情况

Table 1 Subject information

Items	Test group (n = 28)	Control group (n = 32)	t/χ^2	P
Age/years	49.68 ± 10.38	50.38 ± 12.28	-0.235 [▲]	0.815
Male	15	21	0.904 [*]	0.194
Neck dissection range			5.536 [*]	0.137
I - II	8	14		
I - III	20	16		
I - IV	0	2		
Bilateral	4	9	1.685 [*]	0.194
Flap reconstruction	25	24	2.036 [*]	0.154
Postoperative radiotherapy	8	13	0.954 [*]	0.329
Postoperative chemotherapy	12	9	1.425 [*]	0.233

▲ Two independent samples *t*-test was used; *Person chi-square test was used. There was no statistically significant difference between the two groups in the subjects' basic conditions, suggesting that the baseline data of the two groups were comparable

及同侧耳朵,后伸情况良好。

2.3.2 时间单独效应 使用广义估计方程,将模型中出现的协变量固定为下列值:清扫范围=2.683 3,颈清范围=1.216 7,皮瓣修复=0.75,术后放疗=0.23,计算得到不同组别时间单独效应。在试验组,术后3个月(93.48 ± 9.36) vs. 术后6个月(98.21 ±

表2 广义线性模型效应分析结果

Table 2 Results of generalized Linear Model model effects analysis

Effects	Wald χ^2	P
Intercept	26 067.920	< 0.001
Group	21.872	< 0.001
Time	103.656	< 0.001
Group × Time	34.255	< 0.001

NDII was set as the dependent variable; grouping, measurement time, and (measurement time × grouping) were included in the generalized linear model; total equation Wald $\chi^2 = 111.225$; $P < 0.001$. Statistical significance was found in the grouping × measurement time results, suggesting that there was an interaction effect between grouping and measurement time, and that the separate effects of grouping and measurement time should be explored further

4.76) vs. 术后12个月(97.23 ± 4.88)NDII得分具有统计学意义($P < 0.001$),提示随着术后时间推移,试验组患者的肩关节功能在不断变化。在对照组,术后3个月(80.00 ± 11.34) vs. 术后6个月(90.70 ± 9.12) vs. 术后12个月(96.33 ± 4.49)NDII得分也具有统计学意义($P < 0.001$),提示在对照组患者的肩关节功能也随着时间在不断变化。术后3个月两组患者肩关节功能相关生活质量最低,并随着术后时间推移逐渐提升(见表3)。

表3 不同分组受试者不同时间点的淋巴清扫损伤指数比较

Table 3 Comparison of neck dissection impairment index at different time points among subjects in different groups

Items	Neck dissection impairment index				95% CI of Wald	Wald χ^2	P
	Before surgery	3 month after surgery	6 month after surgery	12 month after surgery			
Test group (n = 28)	100 ± 0.00	93.48 ± 9.36	98.21 ± 4.76	97.23 ± 4.88	95.29-98.39	21.378	< 0.001
Control group (n = 32)	100 ± 0.00	80.00 ± 11.34	90.70 ± 9.12	96.33 ± 4.49	89.80-93.55	111.225	< 0.001
95% CI of difference		8.060-18.904	3.670-11.352	-1.517-3.325			
t		4.978	3.915	0.748			
P		< 0.001	< 0.001	0.458			

Covariates appearing in the model were fixed to the following values: neck dissection range = 2.683 3, bilateral = 1.216 7, flap reconstruction = 0.75, and radiotherapy = 0.23. The results suggest that shoulder function-related quality of life was lowest in the test and control groups at 3 months postoperative and gradually improved with postoperative time; at 3 months postoperative and at 6 months postoperative, patients in the test group had a higher shoulder function-related quality of life than the control group's quality of life; at 3 and 6 months postoperative, patients in the test group had a higher shoulder function-related quality of life than the control group's quality of life. Quality of life was higher than that of the control group

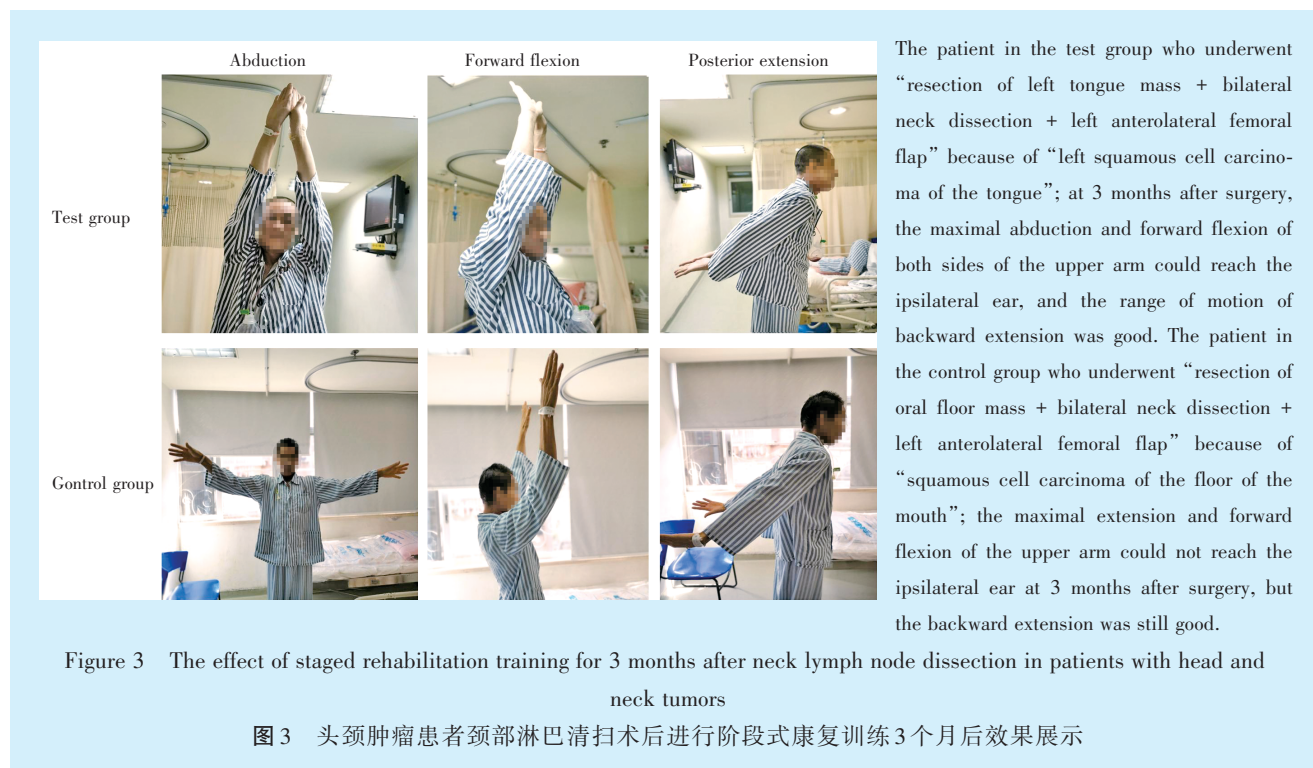


Figure 3 The effect of staged rehabilitation training for 3 months after neck lymph node dissection in patients with head and neck tumors

图3 头颈肿瘤患者颈部淋巴清扫术后进行阶段式康复训练3个月效果展示

3 讨论

3.1 阶段式康复训练法在保留副神经的颈部淋巴清扫术患者中应用具有较强可行性

颈部淋巴清扫术是治疗头颈肿瘤颈部淋巴转移灶的有效方法^[17]。尽管外科医生不断对手术方式进行革新,由于个体差异和人类对疾病的认识的有限性,实现完全个体化切除仍存在一定困难,术后副神经损伤和肩关节功能障碍仍时有发生。颈部淋巴清扫术后患者肩关节功能障碍表现为肩下垂,“有翼肩胛骨”(肩胛骨异常突出),不能耸肩,有僵硬感,肩部广泛性钝痛,常因运动而加重。其病理原因大致可以分为3类:神经纤维脱髓鞘、神

经元轴突断裂、神经断裂^[18]。其中神经纤维脱髓鞘表现为短暂的神经营痹,其恢复取决于纤维髓鞘再生,最快恢复需要6~8周,后两者损伤则需要18~24个月才能恢复^[18-19]。肩胛骨的动态稳定是维持正常肩关节功能的重要因素,但副神经损伤会导致斜方肌肌肉力量与长度改变,使保持肩胛骨动态稳定的肌肉群的功能紊乱,导致肩胛骨长期处于内旋状态,出现关节内活动异常和炎症反应^[20]。颈部淋巴清扫术后肩关节功能障碍发病原因和病理基础,为术后阶段式康复训练计划制定提供了理论基础支持。目前缓解颈部淋巴清扫术后肩关节功能障碍的康复技术主要有被动运动训

练(passive range of motion exercises)、主动运动训练(active range of motion movements)、辅助主动运动训练(active-assisted range of motion exercise)、渐进式抗阻训练(progressive resistance training, PRT)、本体感觉神经肌肉促进疗法(proprioceptive neuromuscular facilitation, PNF)等^[10]。本研究中,阶段性锻炼方法是在被动运动训练、辅助主动运动训练、渐进式抗阻训练疗法的基础上通过各方讨论后形成,并在研究期间未收到研究对象关于其副作用的负反馈,具有较强的可行性。

3.2 阶段式康复训练法能有效改善患者术后早期的肩关节功能障碍

在本研究中,试验组和对照组的受试者接受了保留副神经的颈部淋巴清扫手术,在术后12个月内,其肩关节功能相关生活质量最低的时间为术后第3个月,提示即使保留副神经,颈部淋巴清扫相关肩关节功能障碍也仍会一定的发生率。这可能与手术或放疗导致的肩胛肌肌力和耐力下降有关^[5]。随着时间推移,两组受试者颈部淋巴清扫指数得分逐渐升高,至术后第12个月基本接近术前水平。但经过阶段式康复训练干预的受试者,术后第3个月和术后第6个月NDII得分显著高于对照组,即试验组受试者的肩关节功能生活质量恢复较快。且在术后第6个月,试验组颈部淋巴清扫指数得分已接近术前水平,提示阶段式康复训练法能够有效缓解患者的早期肩关节功能障碍。以往研究确定了早期康复运动训练对颈部淋巴清扫术后肩关节功能障碍康复的有效性^[21]。但康复训练开始的时机、持续时间和患者管理仍是广泛讨论的热点。Rodriguez等^[22]建议在可能的情况下尽量在手术前开展预防性康复计划,与本研究的理念一致。在持续时间方面,多数研究认为保留副神经的肩关节功能损伤患者,通过适当的干预,术后6~12个月基本可恢复至术前水平^[23]。本研究结果也提示患者术后12个月,其肩关节功能状态及相关生活质量基本恢复至术前水平。在患者管理方面,McNeely等^[24]提出小组训练法更能有效改善肢体功能能力。Hong等^[25]提出以护士主导的术后居家运动训练的咨询干预模式,可改善头颈癌患者颈部淋巴清扫术后患者的肩关节疼痛和生活质量。McGarvey等^[26]则提倡物理治疗师参与肩关节功能障碍的筛查与干预能有效提高患者的筛查率和救治率。本研究结果显示,护士主导的阶段式渐进抗阻康复训练持续6个月也能起到较好

的康复效果。

综上所述,阶段式康复训练法在保留副神经的颈部淋巴清扫术患者中应用具有较强的可行性,能够快速提升患者术后6个月内肩关节功能相关生活质量。由于头颈肿瘤患者术后肩关节功能康复时间长,建议建立康复治疗团队,积极发动外科医生、护士和康复治疗师参与,并在术前开始预防性康复计划,以家庭为单位进行干预。推荐护士为主导进行患者管理至术后6~12个月,外科医生和康复治疗师进行护士和患者及家庭的相关医学和康复知识培训,并开展针对性治疗。

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