

doi: 10.13241/j.cnki.pmb.2021.09.016

PAHG 取出同期和二期乳房再造的效果及术后评价 *

孟祥海¹ 王媛媛^{2△} 孙超峰¹ 华 振¹ 赵卓伟¹

(1 空军军医大学第二附属唐都医院烧伤整形科 陕西 西安 710100; 2 陕西省延安市人民医院乳腺外科 陕西 延安 716000)

摘要 目的:对聚丙烯酰胺水凝胶注射物(polyacrylamide hydrogel, PAHG)取出同期和二期乳房再造术的疗效及预后情况进行比较,为临床治疗提供一定的经验。**方法:**以2017年4月~2019年4月我院收治的PAHG取出乳房再造患者为研究对象,采用随机法结合患者需求分为I组和II组,I组进行PAHG取出同期乳房再造,II组进行PAHG取出后二期乳房再造,以手术指标(手术时间、出血量、拔管时间和住院时间)、并发症(疼痛、感染、肿胀和形态不佳等)、术后生命质量及自尊评分为指标对两组疗效及预后情况进行评价。**结果:**I组和II组第一阶段手术时间、出血量、拔管时间和住院时间比较,均无显著差异($P>0.05$),II组第二阶段各项指标较第一阶段均显著降低($P<0.05$);两组患者各项并发症发生率均无显著差异($P>0.05$),但I组患者疼痛和形态不佳发生率略高于II组,II组包膜挛缩发生率略高于I组,两组并发症总发生率无统计学差异($P>0.05$);I组术后1个月生命质量和自尊评分均显著高于II组($P<0.05$),两组术后6个月和12个月两组生命质量和自尊评分无明显差异($P>0.05$);与术后1个月相比,两组患者术后6个月和12个月的生命质量和自尊评分均显著提高($P<0.05$)。**结论:**两种PAHG取出后乳房再造术的效果和预后均良好,可根据患者情况和自身意愿进行选择,值得临床推广应用。

关键词: AHG; 乳房再造; 疗效; 术后评价

中图分类号: R655.8; R622 **文献标识码:** A **文章编号:** 1673-6273(2021)09-1673-05

The Effect and Postoperative Evaluation of Breast Reconstruction in the Same Period and Second Stage after PAHG Removal*

MENG Xiang-hai¹, WANG Yuan-yuan^{2△}, SUN Chao-feng¹, HUA Zhen¹, ZHAO Zhuo-wei¹

(1 Department of Burns and Plastic Surgery, Tangdu Hospital, Second Affiliated Military Medical University, Xi'an, Shaanxi, 710100, China;

2 Breast Surgery, People's Hospital of Yan'an City, Shaanxi Province, Yan'an, Shaanxi, 716000, China)

ABSTRACT Objective: Compare the efficacy and prognosis of PAHG removal during the same period and second stage breast reconstruction to provide some experience for clinical treatment. **Methods:** Taking the PAHG patients undergoing breast reconstruction in our hospital from April 2017 to April 2019 as the research object, they were divided into group I and group II using random methods combined with the needs of patients. Group I received breast reconstruction during the same period after taking PAHG, and Group II received second-stage breast reconstruction after taking PAHG. The operation indexes (operation time, bleeding volume, extubation time and hospitalization time), complications (pain, infection, swelling and poor morphology, etc.), postoperative quality of life and self-esteem score were used as indicators to evaluate the efficacy and prognosis of the two groups. **Results:** There was no significant difference in the first stage operation time, bleeding volume, extubation time and hospital stay between group I and group II ($P>0.05$). The indexes in the second phase of Group II were significantly lower than those in the first phase ($P<0.05$). There was no significant difference in the incidence of various complications between the two groups of patients ($P>0.05$). However, the incidence of pain and poor morphology in group I was slightly higher than that in group II, and the incidence of capsular contracture in group II was slightly higher than that in group I. The total incidence of complications between the two groups was not statistically different ($P>0.05$); The quality of life and self-esteem scores of group I at 1 month after operation were significantly higher than those of group II ($P<0.05$). There were no significant differences in the quality of life and self-esteem scores at 6 and 12 months after operation between the two groups ($P>0.05$). Compared with 1 month after operation, the quality of life and self-esteem scores of the two groups of patients at 6 and 12 months after operation were significantly improved ($P<0.05$). **Conclusion:** The results and prognosis of breast reconstruction after PAHG removal are good, and they can be selected according to the patient's condition and their own wishes, which is worthy of clinical promotion and application.

Key words: PAHG; Breast reconstruction; Efficacy; Postoperative evaluation

Chinese Library Classification (CLC): R655.8; R622 **Document code:** A

Article ID: 1673-6273(2021)09-1673-05

* 基金项目: 陕西省科学技术研究发展计划项目(2016SF-217)

作者简介: 孟祥海(1972-), 男, 本科, 副主任医师, 研究方向: 烧伤整形科, 电话: 15353531720, E-mail: wyyy197@163.com

△ 通讯作者: 王媛媛(1981-), 女, 本科, 副主任医师, 研究方向: 乳腺肿瘤, 电话: 18909117755, E-mail: 879563003@qq.com

(收稿日期: 2020-09-26 接受日期: 2020-10-21)

前言

伴随着经济、外科学以及组织工程学的发展,人们对外观的要求也随之不断提高,整形外科迅速发展,其中乳房整形是其中一个重要分支^[12]。上世纪末,聚丙烯酰胺水凝胶(Polyacrylamide hydrogel, PAHG)注射隆胸手术被引入我国,PAHG透明无色无味、组织形态稳定的胶状物质,当时认为PAHG是一种安全的隆胸材料,且注射方法简单、不开刀、术后无瘢痕、无痛而备受青睐^[34]。近年研究表明,长期临床使用后,注射PAHG隆胸术会出现多种并发症,如乳房感染变形、出现肿块、胸部疼痛、乳头破溃、纤维肉芽肿等^[5-8]。同时由于PAHG的极强水溶性,在人体内有一定的游走性,可深入胸肌间隙以及腋窝等部位,甚至导致上肢活动障碍和乳腺癌等疾病^[9-11],最终我国于2006年全面禁止PAHG的生产、销售和使用^[12]。

目前因担心潜在危险而要求将PAHG取出的患者也越来越多,但是PAHG取出后乳房形态的变化,需要进行乳房再造

手术^[13]。乳房的重塑不仅能增加女性的曲线美,而且还能减轻患者精神压力和心理负担,重拾自信心^[14-17]。目前对其PAHG取出后乳房再造手术的时机有一定的争议,因此本研究以手术指标(手术时间、出血量、拔管时间和住院时间)、并发症(疼痛、感染、肿胀和形态不佳等)、术后生命质量及自尊评分等为指标,对PAHG取出同期和二期乳房再造术的疗效及预后情况进行比较,为临床治疗提供一定的经验。

1 研究对象

1.1 基本信息

以2017年4月~2019年4月我院收治的PAHG取出乳房再造患者为研究对象,采用随机法结合患者需求分为I组和II组,其中I组46例(乳房92只),II组44例(乳房88只),具体一般资料见表1所示,两组患者基本信息如年龄、PAHG注射时间、并发症等比较无统计学意义($P>0.05$),具有可比性。

表1 基本资料比较

Table 1 Comparison of basic data

Groups	Age(years)		Injection time (years)		Lump nodules (case)	Lump nodules (case)	Pain(case)	Shape change (case)	Injection transfer (case)	Bilateral asymmetry (case)
	Age range	Average age	Range	Average Course						
Group I (n=92)	30~57	40.3± 10.8	11~17	15.3± 3.5	137.9± 39.9	78	65	68	32	16
Group II (n=88)	32~55	39.7± 9.6	10~18	15.6± 4.7	135.3± 41.6	75	67	71	36	15

1.2 纳入与排除标准

纳入标准:(1)行PAHG水凝胶注射后出现并发症者,或无并发症者但强烈要求取出者;(2)患者要求进行乳房再造重塑乳房外形者;(3)术前局部无炎症反应;(4)既往无其他乳房手术者。排除标准:(1)存在严重并发症如红肿热痛者;(2)已进行其它乳房手术者;(3)合并严重心、肝、肾等器官疾病者;(4)存在凝血功能障碍疾病。

1.3 研究方法

1.3.1 术前准备 对所有患者进行血液检查(血常规、免疫、生化及凝血)、心电图、胸片以及彩超等检查。通过超声、MRI等手段术前检查明确PAHG注射物分布情况、周围组织浸润程度等,预测其注射总量,划线标记需取出的范围,确定需要使用的假体大小。

1.3.2 手术方法 PAHG的取出:所有患者均采用全身麻醉,取仰卧位,双臂外展80度,于乳房下皱襞作3 cm左右的切口,局部止血,依次切开皮肤、皮下组织至腺体后间隙,可见触及异常隆起的PAHG纤维包膜,从包膜外侧锐性分离,将其完整取出,若胞膜破裂,用负压吸引器或刮勺将注射物彻底吸出或刮除,并去除残余囊壁。对乳腺组织、乳腺后间隙以及深方胸大肌进行探查,切除变性组织和周围变性脂肪结缔组织。以稀释碘伏冲洗创腔,再使用生理盐水及庆大盐水反复冲洗至冲洗液为清亮色,对出血点进行止血。

I组进行PAHG取出同期乳房再造:超声检测显示无

PAHG凝胶残留后,进行同期硅凝胶假体植入术。根据术前测量乳房数据、影像学及患者意愿选择合适假体,用庆大盐水溶液浸泡,沿胸大肌后间隙锐性分离出合适囊腔植入浸泡好的假体,调整双乳形态及位置,于乳腺后间隙最低位置放置引流管,逐层缝合。

II组进行PAHG取出后二期乳房再造:PAHG水凝胶取出后,将软组织扩张器植入于胸大肌后间隙,规律注水6~12个月,注水量达到进行假体植入标准后,取出扩张器,植入硅凝胶假体。患者采取全身麻醉,取仰卧位,双臂外展80度,局部注射止血水,在原手术瘢痕处切开,于胸大肌后间隙处打开扩张器包膜,取出扩张器,植入假体,调整双乳形态及位置,于乳腺后间隙最低位置放置引流管,逐层缝合。

1.3.3 术后处理 患者术后加压包扎2~3 d,穿戴定制束身衣以维持假体位置,使用抗生素5~7 d,连续3 d引流量低于20 mL时,可拔除引流管,若引流物过多或有脓性分泌物,使用生理盐水冲洗脓腔,两天换一次药,术后7 d根据伤口愈合情况决定是否拆线。一个月内避免剧烈活动,定期进行乳房按摩。

1.4 观察指标分析

(1)手术指标:记录患者手术时间、出血量、拔管时间和住院时间^[18]。(2)术后并发症:记录患者的术后疼痛、感染、肿胀、形态不佳以及包膜挛缩等并发症情况^[19]。(3)生命质量和自尊评分比较:分别记录两组患者术后1个月、6个月以及12个月的生命质量和自尊评分。(4)生命质量评分:采用SF-36量表^[20]进

行生命质量评分,分数范围为 0~100,分值越高,表示生命质量越高;自尊评分:采用 Rosenberg 自尊量表 (Self-esteem Self Scale, SES)^[21]进行自尊评分,分值越高,表示自尊程度越高。

1.5 数据处理

应用 SPSS 19.0,计量资料以 $\bar{x} \pm s$ 示,用 t 检验,计数资料以(%)示,用 χ^2 检验, $P < 0.05$ 有统计学意义。

2 结果

2.1 手术指标比较

对两组手术指标进行比较,结果见表 2 所示。I 组和 II 组

第一阶段手术时间、出血量、拔管时间和住院时间比较,均无显著差异($P > 0.05$),II 组第二阶段各项指标较第一阶段均显著降低($P < 0.05$)。

2.2 术后并发症比较

对两组术后 12 个月内的疼痛、感染、肿胀、形态不佳以及包膜挛缩并发症情况进行统计分析,结果见表 3 所示。两组各项并发症发生率均无显著差异($P > 0.05$),但 I 组疼痛和形态不佳发生率略高于 II 组,II 组包膜挛缩发生率略高于 I 组,两组并发症总发生率无统计学差异($P > 0.05$)。

表 2 两组手术指标比较(例,%)

Table 2 Comparison of surgical indexes between the two groups (n,%)

Groups	Operation time(min)	Bleeding volume(mL)	Extubation time(d)	Length of hospitalization(d)
Group I (n=92)	193.4 $\pm$ 21.7	190.3 $\pm$ 19.4	11.8 $\pm$ 2.3	12.5 $\pm$ 2.5
Group II (n=88)	The first stage	190.2 $\pm$ 19.3	189.4 $\pm$ 19.7	12.1 $\pm$ 1.9
	The second stage	119.3 $\pm$ 20.9*	42.8 $\pm$ 7.1*	5.4 $\pm$ 2.1*

Note: * $P < 0.05$, compared with the second stage of Group II.

表 3 两组术后并发症比较(例,%)

Table 3 Comparison of postoperative complications between the two groups (n,%)

Groups	Pain	Infection	Swelling	Poor morphology	Capsular contracture	Incidence of complications
Group I (n=92)	16(17.4)	5(5.4)	7(7.6)	12 (13.0)	3(3.3)	16(17.4)
Group II (n=88)	12(13.6)	3(3.4)	6(6.8)	6(6.8)	7(8.0)	12(13.6)

Note: * $P < 0.05$ compared with before treatment.

2.3 生命质量和自尊评分比较

对两组术后 1 个月、6 个月和 12 个月的生命质量和自尊评分进行比较,结果见表 4 所示,I 组术后 1 个月生命质量和自尊评分均显著高于 II 组($P < 0.05$),两组术后 6 个月和 12 个月

两组生命质量和自尊评分无明显差异($P > 0.05$);与术后 1 个月相比,两组患者术后 6 个月和 12 个月的生命质量和自尊评分均显著提高($P < 0.05$)。

表 4 两组生命质量和自尊评分比较

Table 4 Comparison of quality of life and self-esteem score between two groups

Groups	Quality of life score			Self-esteem score		
	1 month after operation	6 months after operation	12 months after operation	1 month after operation	6 months after operation	12 months after operation
Group I (n=92)	83.11 $\pm$ 14.22	88.63 $\pm$ 16.49 [#]	98.21 $\pm$ 14.96 [#]	18.19 $\pm$ 5.45	27.69 $\pm$ 4.82 [#]	34.05 $\pm$ 5.60 [#]
Group II (n=88)	77.76 $\pm$ 16.17*	85.8 $\pm$ 14.26 [#]	96.09 $\pm$ 16.34 [#]	14.28 $\pm$ 4.43*	24.89 $\pm$ 4.84 [#]	33.52 $\pm$ 5.15 [#]

Note: *compared with group I, $P < 0.05$; # compared with 1 month after operation, $P < 0.05$.

3 讨论

乳房先天发育不良、年纪增加或哺乳后的乳房下垂、乳腺疾病所致的乳腺切除手术等原因,严重影响了女性的形体美,同时也为生活和心理造成了严重的影响^[22]。乳房填充术能很好的改善及恢复乳房外形,增加生活质量和自信心。PAHG 水凝胶是一种无色透明的凝胶状物质,由聚丙烯酰胺和水组成,生物相容性高,可塑性强,主要用于乳房、面部、臀部以及四肢等部位的填充,尤其是在面部和乳房整形手术中,效果明显^[23-25]。

但随着临床使用的增加,逐渐发现 PAHG 注射物所引起的一系列并发症,如感染、疼痛、双乳变形、注射物移位等,又因为 PAHG 有一定的游走性,对机体生命循环系统造成严重伤害,需要尽早将 PAHG 注射物及病变组织取出^[26,27]。

PAHG 注射物取出后引起的乳房畸形,严重影响患者自信心,因此需进行乳房再造术^[28]。一部分患者因难以接受,迫切需要 PAHG 取出后同期进行乳房再造,能帮助患者找回自信心,减少心理压力;也有部分患者因为恐惧不能接受同期假体植入,但又因为 PAHG 取出后乳房外观较差,严重影响了正常生

活,又再次接受乳房再造手术。本研究对 PAHG 取出后同期乳房再造和二期乳房再造的手术指标进行比较,显示 I 组和 II 组第一阶段手术时间、出血量、拔管时间和住院时间比较,均无显著差异,II 组第二阶段各项指标较第一阶段均显著降低。与何宸^[20]的研究不同,研究 PAHG 取出同期乳房再造病例筛选及可行性,结果显示 PAHG 取出在第一阶段植入扩张器,其手术时间、术中出血量、引流管拔出时间、住院时间均较对照组增多,而在第二阶段扩张器置换乳房假体,上述观察指标与对照组比较无显著差异。分析其原因为 PAHG 少量的残留、取出时机不同有关。

临床上对于 PAHG 手术取出时机存在一定的争议,有学者认为,由于 PAHG 凝胶极易与腺体和肌肉产生融合浸润,会对乳腺和胸大肌周围的正常组织造成损伤,进而导致乳腺和肌肉的变性和坏死,取出 PAHG 同期行乳房再造术以产生包膜挛缩。另有研究表明 PAHG 少量的残留且同期进行乳房再造不会引起并发症的增加^[30,31]。因此本研究对两组患者术后 12 个月内的疼痛、感染、肿胀、形态不佳以及包膜挛缩并发症情况进行统计分析,两组患者各项并发症发生率均无显著差异,但 I 组患者疼痛和形态不佳发生率略高于 II 组,II 组包膜挛缩发生率略高于 I 组,两组并发症总发生率无统计学差异。与朱艳^[32]的研究也探讨 PAHG 取出,再次行硅凝胶假体植入隆胸的最佳时机,发现随访 12 个月,PAHG 取出术后同期联合行硅凝胶假体植入术较 PAHG 取出术后 6 个月行硅凝胶假体植入术患者引流管拔时间经统计学分析差别有统计学意义,对两组患者硅凝胶假体植入术后 12 个月内并发症例数进行统计分析:疼痛、形态不良发生率经统计学分析差别有统计学意义,出血及血肿、感染、包膜挛缩发生率经统计学分析差别无统计学意义,对两组患者硅凝胶假体植入术后 12 个月内总的并发症例数进行统计分析差异无统计学意义。若患者术前检查显示乳腺影像不明显者,很可能是 PAHG 注射物与周围腺体和组织广泛融合,同时在术中的探查也可确定是否产生广泛融合,如果 PAHG 注射物发生广泛融合,局部的炎性反应会刺激包膜的形成,不应进行同期乳房再造。

同时本研究也对两组患者术后 1 个月、6 个月和 12 个月的生命质量和自尊评分进行比较,I 组术后 1 个月生命质量和自尊评分均显著高于 II 组,两组术后 6 个月和 12 个月两组生命质量和自尊评分无明显差异;与术后 1 个月相比,两组患者术后 6 个月和 12 个月的生命质量和自尊评分均显著提高。术后短期内 PAHG 取出后同期乳房再造患者生命质量和自尊评分高于二期乳房再造患者,但长期生命质量和自尊评分无统计学差异,目前还没有比对 PAHG 取出后同期乳房再造患者生命质量和自尊评分,本研究创新性的关注了患者的生命质量和自尊评分,得到了有效的结果,即两种乳房再造术患者对术后乳房形态和生活质量均感到满足,乳房形态美观和术后的逐渐恢复,生命质量和自尊评分明显提高。

综上所述,两种 PAHG 取出后乳房再造术的效果和预后均良好,可根据患者情况和自身意愿进行选择,值得临床推广应用。

参考文献(References)

[1] Sigurjonsson H, Jordal M. Addressing Female Genital Mutilation/Cut-

ting (FGM/C) in the Era of Clitoral Reconstruction: Plastic Surgery [J]. *Curr Sex Health Rep*, 2018, 10(2): 50-56

- [2] Cai Y, Liu B, Liao M, et al. Application of Periareolar Mammoplasty with the Tissue Folding Technique in Breast Reshaping following Polyacrylamide Hydrogel Removal[J]. *Breast Care*, 2019, 15(2): 1-6
- [3] Yang Y, Li S, He J, et al. Clinicopathological Analysis of 90 Cases of Polyacrylamide Hydrogel Injection for Breast Augmentation Including 2 Cases Followed by Breast Cancer [J]. *Breast Care*, 2019, 15(1): 1-6
- [4] Ibrahim RM, Lauritzen E, Krammer CW. Breastfeeding difficulty after polyacrylamide hydrogel (PAAG) mediated breast augmentation[J]. *Int J Surg Case Rep*, 2018, 47(2): 67-70
- [5] Jin R, Luo X, Wang X, et al. Complications and Treatment Strategy After Breast Augmentation by Polyacrylamide Hydrogel Injection: Summary of 10-Year Clinical Experience [J]. *Aesthetic Plast Surg*, 2017, 9(42): 402-409
- [6] K Stner S, Gonser P, Paprottka F, et al. Removal of Polyacrylamide Gel (Aquamid?) from the Lip as a Solution for Late-Onset Complications: Our 8-Year Experience [J]. *Aesthetic Plast Surg*, 2018, 7(42): 791-797
- [7] Wang C, Panayi AC, Xin M. Opinions on the Treatment Strategy After Breast Augmentation by Polyacrylamide Hydrogel Injection [J]. *Aesthetic Plast Surg*, 2018, 42(3): 922-923
- [8] Li G, Zhang G, Sun R, et al. Mechanical strengthened alginate/polyacrylamide hydrogel crosslinked by barium and ferric dual ions [J]. *J Mater Sci*, 2017, 52(14): 8538-8545
- [9] Chen L, Wang J, Yu L, et al. Experimental Investigation on the Nanosilica Reinforcing Polyacrylamide/Polyethylenimine Hydrogel for Water Shutoff Treatment [J]. *Energy Fuels*, 2018, 32 (6): 6650-6656
- [10] Cao Y, Qi X, Yan H. Selective adsorption of tannins over small polyphenols on cross-linked polyacrylamide hydrogel beads and their regeneration with hot water [J]. *React Funct Polym*, 2019, 146(23): 104398-104403
- [11] Overgaard A, Henriksen M, Bliddal H. Safety assessment of intra-articular 2.5% polyacrylamide hydrogel for treatment of knee osteoarthritis[J]. *Osteoarthritis Cartilage*, 2018, 26: S292
- [12] 刘雪飞,吴舒,阳水发,等. PAHG 注射隆乳术后合并浸润性导管癌一例[J]. *中国美容整形外科杂志*, 2017, 28(11): 651-652
- [13] Adibnia V, Hill RJ. Viscoelasticity of near-critical silica-polyacrylamide hydrogel nanocomposites [J]. *Polymer*, 2017, 112 (65): 457-465
- [14] Hardy KM, Fuller K, Rokosz J, et al. Analysis of the Differences in Pre- and Post-Breast Reconstruction Quality of Life in Appalachian Patients and Patients from Metropolitan Areas Using Breast-Q Data [J]. *J Am Coll Surg*, 2018, 227(4): 1189-1196
- [15] Lilian, Baldan, Zaccaro, et al. Patient satisfaction with breast reconstruction using musculocutaneous flap from latissimus dorsi versus from rectus abdominis: a cross-sectional study [J]. *Sao Paulo Med J*, 2019, 136(6): 551-556
- [16] Chen W, Lv X, Xu X, et al. Meta-analysis for psychological impact of breast reconstruction in patients with breast cancer[J]. *Breast Cancer*, 2018, 13(25): 464-469

- [17] Enas, Alaloul, MohammedRaed, et al. Awareness and factors influencing breast reconstruction in the Gaza Strip: a cross-sectional study [J]. *Lancet*, 2018, S0140-6736(18): 30378-7
- [18] 郭璐,修秉虬,苏永辉,等.中国乳腺癌术后植入物乳房重建现状调查[J].*中华外科杂志*, 2019, 57(8): 616-621
- [19] 赵钊,李娟,金泉秀,等.乳房再造对乳腺癌根治术患者术后无病生存率和生活质量的影响[J].*解放军医药杂志*, 2019, 31(1): 26-29
- [20] 何燕,赵龙超,刘丹萍,等. SF-36 和 SF-12 在人群生命质量调查中的性能比较研究[J].*现代预防医学*, 2017, 44(5): 90-100
- [21] Li Z, Jun G, Chang-Xiang C, et al. Relationship between physical and mental status and conjugal relation among breast cancer patients[J]. *Mod Prev Med*, 2018, 18(9): 39-45
- [22] 高峰清,张海宏,冯秀梅.保乳术联合前哨淋巴结活检与传统乳腺癌根治术对乳腺癌患者临床疗效及应激指标观察[J].*川北医学院学报*, 2019, 34(1): 106-109
- [23] Liu J, Su D, Yao J, et al. Soy protein-based polyethylenimine hydrogel and its high selectivity for copper ion removal in wastewater treatment[J]. *J Mater Chem*, 2017, 5(8): 4163-4171
- [24] Nickolay Markov, Michael Alperovich, Tomer Avraham. Comment on: Complications and Treatment Strategy After Breast Augmentation by Polyacrylamide Hydrogel Injection-Summary of 10 Years' Clinical Experience[J]. *Aesthetic Plast Surg*, 2017: 1-2
- [25] Zhang MX, Li SY, Xu LL, et al. Repeated lumps and infections: A case report on breast augmentation complications [J]. *World J Clin cases*, 2019, 23(20): 565-572
- [26] Ku I, Park JU. Complications of polyacrylamide hydrogel injection for breast augmentation: A case report review and literature [J]. *Case Rep*, 2019, 25(3): 119-123
- [27] Chen WH, Liao WC, Sohn YS, et al. Drug Carriers: Stimuli-Responsive Nucleic Acid-Based Polyacrylamide Hydrogel-Coated Metal-Organic Framework Nanoparticles for Controlled Drug Release (Adv. Funct. Mater. 8/2018)[J]. *Adv Funct Mater*, 2018, 28(8): e1870053
- [28] Zhang F, Wang X, Guo H. Different Types of Breast Deformity Induced by Two Types of Polyacrylamide Hydrogel and Corresponding Treatment[J]. *Aesthet Surg J*, 2020, 44(2): 1478-1485
- [29] 何宸.聚丙烯酰胺水凝胶注射物(PAHG)隆乳取出后一期乳房再造与二期乳房再造的效果对比分析及随访评价[D].中国医科大学, 2019
- [30] Huimin W, Ting Z, Lin T, et al. Self-Assembling RADA16-I Peptide Hydrogel Scaffold Loaded with Tamoxifen for Breast Reconstruction [J]. *Bio Res Int*, 2017, 2017: 1-10
- [31] Gupta, Khushboo, Bhari, et al. Permanent Injectable Polyacrylamide Hydrogel Dermal Filler for Large Subcutaneous Defect Secondary to Lupus Panniculitis[J]. *Dermatol Surg*, 2017, 43(1): 152-159
- [32] 朱艳. PAHG 隆乳取出同期行硅凝胶假体植入术与 II 期行硅凝胶假体植入术的比较[D].新疆医科大学, 2016

(上接第 1709 页)

- [21] Weiser L, Huber G, Sellenschloh K, et al. Time to augment?! Impact of cement augmentation on pediclescrew fixation strength depending on bone mineral density[J]. *Eur Spine J*, 2018, 27(8): 1964-1971
- [22] Xiu J, Bu T, Yan Y, et al. Biomechanical study of space frame structure based on bonecement screw [J]. *Exp Ther Med*, 2020, 19(6): 3650-3656
- [23] Tye EY, Tanenbaum JE, Alonso AS, et al. Circumferential fusion: a comparative analysis between anterior lumbar interbody fusion with posterior pedicle screw fixation and transforaminal lumbar interbody fusion for L5-S1 isthmic spondylolisthesis [J]. *Spine J*, 2018, 18(3): 464-471
- [24] Liu YY, Xiao J, Jin HJ, et al. Comparison of unilateral and bilateral polymethylmethacrylate-augmented cannulated pedicle screw fixation for the management of lumbar spondylolisthesis with osteoporosis[J]. *J Orthop Surg Res*, 2020, 15(1): 446
- [25] Chandra Vemula VR, Prasad BC, Jagadeesh MA, et al. Minimally invasive transforaminal lumbar interbody fusion using bone cement-augmented pedicle screws for lumbar spondylolisthesis in patients with osteoporosis. Case series and review of literature [J]. *Neurol India*, 2018, 66(1): 118-125
- [26] Hong SW, Oh TH, Jeon JM, et al. Cardiac Perforation Caused by Bone Cements as a Complication of Cement Augmented Pedicle Screw Fixation Using the Fenestrated Pedicle Screw: A Case Report [J]. *Korean J Neurotrauma*, 2020, 16(2): 337-342
- [27] Ninomiya K, Iwatsuki K, Ohnishi Y, et al. Radiological Evaluation of the Initial Fixation between Cortical Bone Trajectory and Conventional Pedicle Screw Technique for Lumbar Degenerative Spondylolisthesis[J]. *Asian Spine J*, 2016, 10(2): 251-257
- [28] 姚珍松,唐永超,陈康,等.骨水泥螺钉强化固定伴骨质疏松腰椎滑脱症的稳定性及椎间融合 [J].*中国组织工程研究*, 2016, 20(4): 517-521
- [29] 杨林,杨健齐,关宏业,等.骨水泥强化椎弓根钉内固定治疗腰椎滑脱症合并骨质疏松的疗效观察 [J].*中国骨与关节损伤杂志*, 2019, 34(11): 1181-1183
- [30] 夏斌,卫建民,王小明,等.骨水泥椎弓根钉治疗老年腰椎滑脱症临床疗效观察[J].*检验医学与临床*, 2018, 15(11): 1627-1630, 1634