

Bryan 颈椎人工椎间盘置换术后 10 年随访结果

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【摘要】目的:观察 Bryan 颈椎人工椎间盘置换术后 10 年随访结果和并发症。**方法:**纳入在我院骨科行 Bryan 颈椎人工椎间盘置换术且获得长期随访、临床和影像学资料均完整的 60 例患者,其中神经根型颈椎病 15 例,脊髓型颈椎病 41 例,混合型颈椎病(脊髓型+神经根型)4 例。47 例患者为单节段置换,12 例为双节段置换,1 例为 3 节段置换。随访时间为 124.0±8.3 个月(117~150 个月)。采用 mJOA 评分和 VAS 评分分别评估脊髓型颈椎病和神经根型颈椎病临床疗效,分析二次手术的原因和二次手术方案;颈椎屈伸位 X 线片评估末次随访时节段活动度情况,采用 McAfee 异位骨化分级观察末次随访时异位骨化情况。**结果:**脊髓型颈椎病患者术前 mJOA 评分为 13.4±2.2 分,末次随访时为 15.8±1.1 分($P<0.05$)。神经根型颈椎病患者术前上肢 VAS 评分为 5.7±2.2 分,末次随访时为 0.7±0.9 分($P<0.05$);术前颈痛 VAS 评分为 4.7±2.2 分,末次随访时为 1.0±1.0 分($P<0.05$)。混合型颈椎病患者术前 mJOA 评分为 13.3±3.6 分,末次随访时为 15.4±1.1 分;术前上肢 VAS 评分为 4.3±2.6 分,末次随访时为 1.0±1.4 分;术前颈痛 VAS 评分为 2.8±1.5 分,末次随访时为 2.5±1.9 分。7 例患者接受了二次手术治疗,其中 6 例为手术节段异位骨化(包括初次手术单节段椎间盘置换术 5 例,双节段置换术 1 例;二次手术时 3 个节段异位骨化分级为Ⅲ级,4 个节段为Ⅳ级)导致的新症状而行手术节段二次手术,1 例为邻椎病行后路单开门椎管扩大成形术。74 个手术节段的术前活动度为 7.0°±2.9°,末次随访时活动度为 4.6°±4.1°($P<0.05$)。末次随访时 74 个手术节段中有 53 个节段出现异位骨化,根据 McAfee 异位骨化分级,其中 5 个节段为Ⅱ级,21 个节段为Ⅲ级,27 个节段为Ⅳ级。**结论:**Bryan 颈椎人工椎间盘置换术后随访 10 年取得了较好的疗效,但异位骨化的发生率较高,降低了手术节段的活动度,严重的异位骨化会导致手术节段出现新的神经症状而被迫行二次手术。

【关键词】颈椎病;人工椎间盘置换术;长期随访;异位骨化;二次手术

doi:10.3969/j.issn.1004-406X.2019.02.01

中图分类号:R681.5,R687.3 文献标识码 A 文章编号:1004-406X(2019)-02-0097-06

Cervical arthroplasty with Bryan disc: 10-year follow-up results/ZHAO Yanbin, ZHOU Feifei, SUN Yu, et al//Chinese Journal of Spine and Spinal Cord, 2019, 29(2): 97-102

【Abstract】Objectives: To evaluate the radiographic and clinical outcomes of Bryan cervical disc arthroplasty at 10 years follow-up. **Methods:** Sixty patients with complete clinical and radiographic data were included in this study. The mean follow-up period was 124.0±8.3 months (117-150 months). 47 patients underwent single-level arthroplasty and 12 underwent arthroplasty at two levels. 1 patient underwent arthroplasty at three levels. 15 of the 60 patients presented with radiculopathy and 41 patients with myelopathy, 4 patients were with combined radiculopathy and myelopathy. Clinical evaluations included mJOA score, VAS score, etiology and surgical strategy of reoperations. Radiographic evaluations included heterotopic ossification according to McAfee's classification and the range of motion on dynamic X-rays at baseline and at final follow-up. **Results:** The mJOA score of the patients with myelopathy was 13.4±2.2 at baseline and 15.8±1.1($P<0.05$) at final follow-up. The arm VAS score of the patients with radiculopathy was 5.7±2.2 at baseline and 0.7±0.9($P<0.05$) at final follow-up. The neck VAS score of the patients with radiculopathy was 4.7±2.2 at baseline and 1.0±1.0 ($P<0.05$) at final follow-up. The mJOA score of the patients with combined radiculopathy and myelopathy was 13.3±3.6 at baseline and 15.4±1.1 at final follow-up. The arm VAS score was 4.3±2.6 at baseline and 1.0±1.4 at final follow-up. The VAS neck score was 2.8±1.5 at baseline and 2.5±1.9 at final

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follow-up. 1 patient received reoperation due to adjacent segment disease. 6 patients received revision surgeries at the index level for recurrent radiculopathy or myelopathy caused by heterotopic ossification (The initial surgeries included 1 cases of arthroplasty at two levels and 5 case of single-level arthroplasty; 3 levels were classified as grade III heterotopic ossification and 4 levels as grade IV before the reoperations). On X-ray examination, the range of motion at the operated level was $7.0^{\circ} \pm 2.9^{\circ}$ at baseline and $4.6^{\circ} \pm 4.1^{\circ}$ at final follow-up ($P < 0.05$). Heterotopic ossification was observed in 53(71.6%) levels. According to McAfee's classification, 5 levels were classified as grade II, 21 levels were classified as grade III and 27 levels as grade IV. **Conclusions:** Cervical arthroplasty with Bryan cervical disc prosthesis resulted in fine clinical outcomes at long-term follow-up. The rate of heterotopic ossification was high after Bryan disc arthroplasty and heterotopic ossification accounted for most of the reoperations.

【Key words】 Cervical spondylosis; Cervical disc arthroplasty; Long-term follow-up; Heterotopic ossification; Reoperation

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颈椎人工椎间盘置换术的手术目的是在减压的同时保留手术节段活动度,避免融合术后导致的相邻节段加速退变。2002 年 Goffin 等^[1]首先报道了 Bryan 颈椎人工椎间盘置换术的临床应用。Bryan 颈椎人工椎间盘置换术后长期随访取得了较好的临床和影像学结果^[2-4]。我科于 2003 年 12 月开展 Bryan 颈椎人工椎间盘置换术,术后 5 年随访时临床疗效良好,假体活动度得到保留^[3]。本研究旨在回顾性分析 Bryan 颈椎人工椎间盘置换术后 10 年影像学 and 临床随访结果。

1 资料与方法

1.1 临床资料

Bryan 颈椎人工椎间盘置换术的适应证为脊髓型或/和神经根型颈椎病病例,保守治疗无效;既往无颈椎手术史,无明显的颈椎不稳定和严重骨质疏松症,手术节段无明显椎间隙狭窄、后纵韧带骨化症或感染。

纳入在我院骨科行 Bryan 颈椎人工椎间盘置换术且随访 10 年的病例,其中临床和影像学资料均完整者共 60 例,男 29 例,女 31 例,年龄为 20~59 岁(43.0 ± 7.4 岁)。神经根型颈椎病为 15 例,脊髓型颈椎病为 41 例,混合型颈椎病(脊髓型+神经根型)4 例。接受单节段 Bryan 颈椎人工椎间盘置换术 47 例,双节段置换术 12 例,3 节段置换术 1 例,累计手术节段为 74 个节段。74 个手术节段中,C3/4 6 个,C4/5 12 个,C5/6 45 个,C6/7 11 个。60 例患者的随访时间为 124.0 ± 8.3 个月(117~150 个月)。

1.2 临床评估

脊髓型颈椎病病例采用 mJOA 评分评估术前和末次随访时的神经功能情况;神经根型颈椎病病例采用 VAS 评分评估术前和末次随访时的神经功能情况。

1.3 影像学评估

影像学检查包括术前和末次随访时的颈椎正侧位和过伸过屈位 X 线片检查。过伸和过屈位 X 线片上采用 White 方法^[5]测量手术节段活动度;采用 McAfee 分级^[6]评估术后异位骨化情况,其中 I 级为局部骨化块不超过椎体终板水平线;II 级为局部骨化块超过椎体终板水平线,但不影响假体活动;III 级为局部骨化块超过椎体终板水平线并影响假体活动;IV 级为局部骨化块引起手术节段骨性融合,节段活动度 $< 2^{\circ}$ 。

1.4 统计学分析

采用 SPSS 13.0 软件对临床疗效和节段活动度进行配对样本 t 检验, $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 临床疗效

41 例脊髓型颈椎病患者术前 mJOA 评分为 13.4 ± 2.2 分,末次随访时为 15.8 ± 1.1 分($P < 0.05$)。

15 例神经根型颈椎病患者术前上肢 VAS 评分为 5.7 ± 2.2 分,末次随访时为 0.7 ± 0.9 分($P < 0.05$);术前颈痛 VAS 评分为 4.7 ± 2.2 分,末次随访时为 1.0 ± 1.0 分($P < 0.05$)。

4 例混合型颈椎病患者术前 mJOA 评分为

13.3±3.6 分,末次随访时为 15.4±1.1 分;术前上肢 VAS 评分为 4.3±2.6 分,末次随访时为 1.0±1.4 分;术前颈痛 VAS 评分为 2.8±1.5 分,末次随访时为 2.5±1.9 分。

7 例患者接受了二次手术治疗,其中 6 例为手术节段异位骨化(包括初次手术单节段椎间盘置换术 5 例,双节段置换术 1 例;二次手术时 3 个节段异位骨化分级为Ⅲ级,4 个节段为Ⅳ级)导致的新症状而行手术节段二次手术;1 例为邻椎病行后路单开门椎管扩大成形术,手术间隔时间为 137 个月。没有因为假体移位、术后血肿或感染而接受二次手术治疗者。6 例手术节段二次手术患者包括新发神经根型颈椎病 5 例,新发脊髓型颈椎病 2 例(1 例先发神经根型颈椎病,接受二次手术后复发脊髓型颈椎病);手术间隔时间为 48~150 个月,平均为 98 个月。对于新发神经根型颈椎病患者,二次前路手术使用高速磨钻去除增生骨赘和异位骨化,人工椎间盘假体保持原位,5 例患者的根性疼痛、麻木症状手术后均好转。对于新发脊髓型颈椎患者,二次前路手术使用超声骨刀去除增生骨赘和异位骨化,取出人工椎间盘假体,行钛网植骨钛板固定融合术。7 例患者二次手术后症状均缓解。

2.2 影像学结果

末次随访时,74 个手术节段中有 53 个(71.6%)节段出现异位骨化,根据 McAfee 异位骨化分级,其中 5 个节段为Ⅱ级,21 个节段为Ⅲ级,27 个节段为Ⅳ级(活动度<2°)。

74 个手术节段的术前活动度为 7.0°±2.9°,末次随访时活动度为 4.6°±4.1°($P<0.05$)。按照末次随访异位骨化情况,分为异位骨化组(53 个节段)和无异位骨化组(21 个节段),异位骨化组末次随访时的活动度为 2.6°±2.7°,无异位骨化组为 9.7°±2.5°。典型病例见图 1、2。

3 讨论

3.1 Bryan 颈椎人工椎间盘置换术的临床疗效

Sasso 等^[7]报道 Bryan 颈椎人工椎间盘置换术后 7 年和 10 年随访均取得了较好的临床效果,临床疗效不差于融合术。本研究中脊髓型颈椎病和神经根型颈椎病患者末次随访时均获得了较好疗效。7 例患者接受了二次手术治疗,其中 6 例为手术节段异位骨化导致的新症状而行手术节段二次手术;1 例为邻椎病行后路单开门椎管扩大成形术。钩椎关节增生和异位骨化形成可以导致神经根管狭窄,5 例患者因为神经根管狭窄而出现神

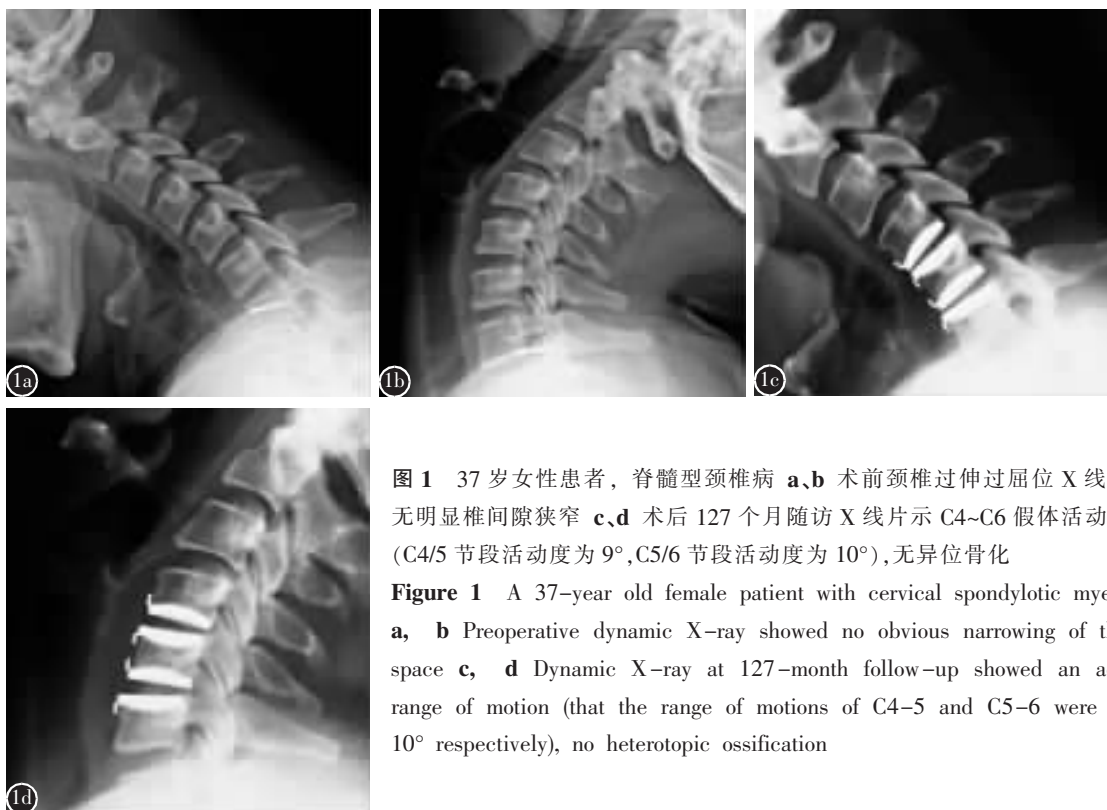


图 1 37 岁女性患者,脊髓型颈椎病 a、b 术前颈椎过伸过屈位 X 线片显示无明显椎间隙狭窄 c、d 术后 127 个月随访 X 线片示 C4~C6 假体活动度良好(C4/5 节段活动度为 9°,C5/6 节段活动度为 10°),无异位骨化

Figure 1 A 37-year old female patient with cervical spondylotic myelopathy a, b Preoperative dynamic X-ray showed no obvious narrowing of the disc space c, d Dynamic X-ray at 127-month follow-up showed an adequate range of motion (that the range of motions of C4-5 and C5-6 were 9° and 10° respectively), no heterotopic ossification

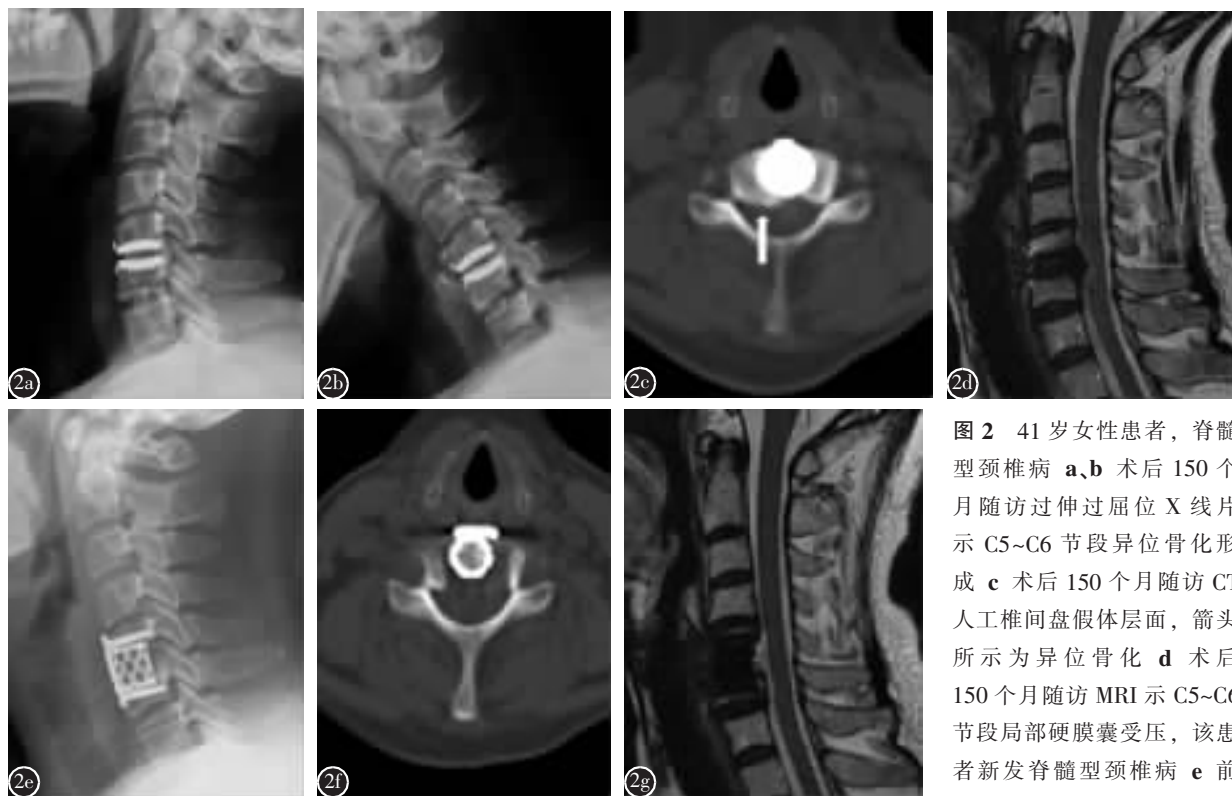


图2 41岁女性患者,脊髓型颈椎病 a、b 术后150个月随访过伸过屈位X线片示C5~C6节段异位骨化形成 c 术后150个月随访CT人工椎间盘假体层面,箭头所示为异位骨化 d 术后150个月随访MRI示C5~C6节段局部硬膜囊受压,该患者新发脊髓型颈椎病 e 前路二次手术后X线片显示

内置物位置良好 f 二次手术后4个月随访CT显示骨性椎管扩大 g 二次手术后4个月随访MRI示局部减压充分

Figure 2 A 41-year old female patient, cervical spondylotic myelopathy a, b Dynamic X-ray at 150-month follow-up showed heterotopic ossification formation c Computed tomography at 150-month follow-up showed heterotopic ossification d Magnetic resonance imaging at 150-month follow-up showed cervical canal stenosis e X-ray after the reoperation showed fusion with titanium mesh and plate fixation f Computed tomography at 4-month follow-up after the reoperation showed enlarged cervical canal g Magnetic resonance imaging at 4-month follow-up after the reoperation showed sufficient decompression

经根性症状。前路二次手术使用高速磨钻去除了增生的骨赘和异位骨化, Bryan人工椎间盘假体保持原位, 二次手术后神经根性症状得到明显缓解。Wenger等^[8]报道采用后路“钥匙孔”入路治疗 Bryan人工椎间盘置换术后新发的神经根管狭窄, 也取得了较好的临床效果。严重的异位骨化也可以延伸到假体后方, 导致新发脊髓型颈椎病, 本研究中2例患者二次手术取出假体, 行钛网植骨钛板固定融合术。

Robertson等^[9]对74例Bryan人工椎间盘置换术和158例前路融合术病例进行2年随访对比分析, 发现X线片上相邻节段退变发生率融合组显著高于椎间盘置换组。Hilibrand等^[10]报道颈椎前路融合术后邻椎病的发生率为每年2.9%。本研究中人工椎间盘置换术后10年随访仅有1例病例出现邻椎病接受了二次手术治疗, 人工椎间盘

置换术通过保留节段活动度, 可能避免融合术后的相邻节段加速退变。

3.2 Bryan人工椎间盘置换术后的活动度

Bryan人工椎间盘假体为耦合运动模式, 能够部分模拟颈椎的生理运动^[11]。颈椎人工椎间盘置换术的手术目的是保留手术节段的活动度, 中长期随访显示Bryan颈椎人工椎间盘置换术后假体活动度得到了保留^[3, 12, 13]。Goffin等^[13]报道单节段Bryan人工椎间盘置换后4年和6年随访时活动度均得到保留。Dejaegher等^[12]报道Bryan人工椎间盘置换后10年随访时活动度平均为8.6°。本研究中, 10年随访时活动度较术前降低。异位骨化的形成可能是导致活动度降低的原因, Ⅲ级异位骨化会降低活动度, Ⅳ级异位骨化时局部活动度<2°。

3.3 Bryan人工椎间盘置换术后异位骨化

异位骨化是人工椎间盘置换术后常见并发症,异位骨化的确切机制尚不明确。McAfee 等^[6]将异位骨化分为 I~IV 级, IV 级异位骨化导致局部活动度丢失。Walraevens 等^[14]对 Bryan 颈椎人工椎间盘置换术病例进行 8 年随访,其中 39% 出现异位骨化。本组患者 74 个节段中 53 个节段出现异位骨化, III~IV 级异位骨化为 48 个节段。Wu 等^[15]报道手术节段术前退变严重的病例异位骨化发生率高。Zhou 等^[16]报道 Bryan 人工椎间盘置换术后异位骨化随时间延长而逐渐发展,术前手术节段明显退变的病例术后更容易出现异位骨化。本组病例异位骨化高发的原因有如下几点:(1)早期进行 Bryan 人工椎间盘置换术缺乏严格的手术适应证指导,未排除术前手术节段明显退变的病例;(2)人工椎间盘置换术仅能部分模拟颈椎的生理运动,异位骨化形成可能是机体对非生理运动的保护机制^[17,18];(3)亚洲地区文献报道异位骨化发生率较高,可能与入种或环境相关。不同类型假体术后异位骨化的发生率存在差异^[19],Mehren 等^[20]报道 ProDisc-C 假体术后 10 年随访异位骨化发生率为 90%,异位骨化的发生与假体的设计和生物力学特性可能相关,异位骨化的发展还有待于进一步深入研究。颈椎人工椎间盘置换术需要有更加严格的手术适应证,Murrey 等^[21]报道骨桥形成、椎间隙狭窄大于 50% 或节段活动度丢失的病例不适合行人工椎间盘置换术。Chung 等^[22]报道钩椎关节退变与术后异位骨化形成密切相关,钩椎关节严重退变的病例可能不适合行人工椎间盘置换术。

总之,本研究结果显示,Bryan 颈椎人工椎间盘置换术后 10 年随访取得了较好的疗效。异位骨化的发生率较高为 71.6%,降低了手术节段的活动度。严重的异位骨化会导致手术节段出现新的神经根型颈椎病或脊髓型颈椎病,是 Bryan 人工椎间盘置换术后二次手术的主要原因。颈椎人工椎间盘置换术的适应证应该更加严格,以降低术后异位骨化的发生率。

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- (收稿日期:2018-10-20 修回日期:2018-12-03)
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(本文编辑 李伟霞)

消息

2019年中国脊柱侧凸年会暨中法脊柱畸形高峰论坛举办通知

由南京鼓楼医院骨科和法国骨科学会(SOFCOT)主办,中国医疗保健国际交流促进会和中国医师协会骨科医师分会脊柱畸形学组协办的2019年中国脊柱侧凸年会暨中法脊柱畸形高峰论坛将于2019年4月12日~15日在南京金陵饭店(汉中路2号)举办,届时将邀请法国骨科学会高级讲师团成员以及国内著名脊柱外科专家做精彩演讲。此次会议内容涵盖国际国内脊柱矫形外科领域研究的最新成果以及精彩的复杂截骨矫形手术演示。本次会议还将同期举办南京鼓楼医院第十九届国家级《脊柱畸形》医学继续教育学习班(4月12日全天为学习班授课),授予继续教育Ⅰ类学分。

会议注册时间:2019年4月11日~12日。

注册费用:1000元/人,食宿统一安排,费用自理。

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欢迎广大同仁踊跃报名参加!