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口腔种植体周围细菌感染病原菌分布特点及细菌感染的危险因素分析*

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摘要 目的:观察口腔种植体周围细菌感染病原菌分布特点,分析细菌感染的危险因素。**方法:**选择360例于2018年7月~2021年5月在我院行口腔种植术的患者。根据是否发生口腔种植体周围细菌感染将患者分为感染组和未感染组。分离鉴定感染组病原菌种类。收集患者的临床资料,引起口腔种植体周围细菌感染的影响因素采用单因素及多因素 Logistic 回归分析。**结果:**360例患者中共有35例发生口腔种植体周围细菌感染,发生率为9.72%。共分离出49株病原菌,其中需氧菌14株(28.57%)、厌氧菌32株(65.31%)、有益菌3株(6.12%);厌氧菌中以口腔链球菌11株(22.45%)、牙龈卟啉单胞菌9株(18.37%)、产黑色素普雷沃菌7株(14.29%)为主。单因素分析结果显示:口腔种植体周围细菌感染的发生与吸烟史、慢性牙周炎病史、饮酒史、是否合并糖尿病、种植体周围牙槽骨情况以及口腔健康习惯有关($P<0.05$);多因素 Logistic 回归分析显示口腔种植体周围细菌感染的危险因素是口腔健康习惯不良、种植体周围牙槽骨不良、合并糖尿病、有饮酒史、有慢性牙周炎病史、有吸烟史($P<0.05$)。**结论:**口腔种植体周围细菌感染的病原菌以厌氧菌为主,种植体周围牙槽骨不良、有慢性牙周炎病史、有吸烟史、合并糖尿病、饮酒史、口腔健康习惯不良是感染发生的危险因素,应针对上述因素进行适当干预。

关键词:口腔;种植体;病原菌分布;细菌感染;危险因素

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Distribution Characteristics of Pathogens and Risk Factors Analysis of Bacterial Infection Around Oral Implants*

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ABSTRACT Objective: To observe the distribution characteristics of pathogens of bacterial infection around oral implants, and to analyze the risk factors of bacterial infection. **Methods:** 360 patients undergoing oral implants in our hospital from July 2018 to May 2021 were selected. Patients were divided into infected group and uninfected group according to the occurrence of bacterial infection around oral implants. Isolate and identify the pathogen species of infection group. The clinical data of patients were collected, the influence factors of bacterial infection around oral implants were analyzed by univariate and multivariate Logistic regression. **Results:** There were 35 cases of bacterial infection around oral implants in 360 patients, and the incidence was 9.72%. A total of 49 strains of pathogenic bacteria were isolated, including aerobic bacteria 14 strains (28.57%), anaerobic bacteria 32 strains (65.31%), beneficial bacteria 3 strains (6.12%). Among anaerobic bacteria, 11 strains of oral streptococcus (22.45%), 9 strains of porphyromonas gingivalis (18.37%) and 7 strains of Melanin-producing Prevotella (14.29%) were the main ones. Univariate analysis showed that the incidence of bacterial infection around dental implants was related to the history of smoking history, chronic periodontitis, drinking history, whether diabetes mellitus, alveolar bone around implants condition and oral health habits ($P<0.05$). Multivariate Logistic regression analysis showed that the risk factors for bacterial infections around dental implants were poor oral health habits, poor alveolar bone around implants, with diabetes mellitus, drinking history, chronic periodontitis and smoking history ($P<0.05$). **Conclusion:** The main pathogenic bacteria of oral implant infection are anaerobic bacteria. Poor alveolar bone around implant, history of chronic periodontitis, smoking history, with diabetes mellitus, drinking history and bad oral health habit are the risk factors of infection, and appropriate intervention should be carried out according to the above factors.

Key words: Oral; Implant; Pathogenic bacteria distribution; Bacterial infection; Risk factors

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前言

口腔种植技术是指通过外科手术的方式将种植体植入人体缺牙部位的上下颌骨内,待手术伤口愈合后,再在其上部安装修复假牙的治疗方式^[1-3]。因口腔种植具有创伤小、操作简单、成功率高等特点,逐渐广泛应用于临床^[4,5]。虽然口腔种植技术现已较为完善,但种植体周围常存在细菌感染,进而导致种植牙失败^[6]。当感染发生后,患者表现出牙周软组织胀痛、红肿等,进而引起种植体松动、丧失等,最终导致手术失败^[7]。因此,了解种植体周围细菌感染的现状以及提早干预是当下临床研究的热点,了解感染的主要病原菌也有助于临床医师进行疾病防控与诊治^[8,9]。本研究选取于我院行口腔种植术的患者作为研究对象,观察口腔种植体周围细菌感染情况以及病原菌分布特点,并分析发生感染的危险因素,以期为其临床防治提供参考。

1 资料与方法

1.1 一般资料

资料概况:选择2018年7月~2021年5月在我院行口腔种植术的360例患者为研究对象。其中男性249例,女性111例;年龄36~82岁,平均年龄(58.53±4.18)岁。本研究获得我院医学伦理委员会批准。纳入标准:①均行口腔种植术;②对本次研究知情同意;③依从性好;④临床资料完整。

排除标准:①近1个月内使用过抗菌药物、免疫抑制剂者;②术前已经存在感染者;③伴有精神疾病患者。

1.2 方法

(1)病原菌分析鉴定:采集感染患者龈沟液,无菌培养瓶盛装,再将标本接种于巧克力平板中,37℃条件下培养48 h,分离培养细菌,依据《全国临床检验操作规程》^[10]中鉴定程序,采用法国梅里埃生物公司生产的VITEK生物鉴定系统分离鉴定病原菌。(2)临床资料采集:资料包括患者体质量指数、性别、口腔健康习惯、饮酒史、种植体周围牙槽骨情况、吸烟史、慢性牙周炎病史、种植部位、合并糖尿病情况、年龄、合并高血压情况,通过病历和自制调查表收集上述资料。

1.3 统计学方法

以SPSS 26.00分析数据。计数资料以率表示,行 χ^2 检验。口腔种植体周围细菌感染的影响因素采用单因素及多因素Logistic回归分析。 $\alpha=0.05$ 为检验水准。

2 结果

2.1 口腔种植体周围细菌感染发生率

入选的患者中发生了口腔种植体周围细菌感染的有35例,发生率为9.72%(35/360)。根据感染情况将患者分为感染组($n=35$)和未感染组($n=325$)。

2.2 口腔种植体周围细菌感染病原菌分布

共分离出49株病原菌,其中厌氧菌32株(65.31%)、需氧菌14株(28.57%)、有益菌3株(6.12%);厌氧菌中又以口腔链球菌11株(22.45%)、牙龈卟啉单胞菌9株(18.37%)、产黑色素普雷沃菌7株(14.29%)为主。见表1。

表1 口腔种植体周围细菌感染病原菌分布[例(%)]
Table 1 Distribution of pathogens around oral implants [n(%)]

Pathogens	Strains	Constituent ratio
Anaerobic bacteria	32	65.31
Oral streptococcus	11	22.45
Porphyromonas gingivalis	9	18.37
Melanin-producing Prevos	7	14.29
Prevotella intermedia	2	4.08
Nucleic acid bacilli	2	4.08
Other	1	2.04
Aerobic bacteria	14	28.57
Beneficial bacteria	3	6.12
Total	49	100.00

2.3 影响口腔种植体周围细菌感染的单因素分析

口腔种植体周围细菌感染的发生与吸烟史、慢性牙周炎病史、饮酒史、种植体周围牙槽骨情况、是否合并糖尿病以及口腔健康习惯有关($P<0.05$),而与性别、年龄、体质量指数、是否合并高血压以及种植部位无关($P>0.05$),见表2。

2.4 影响口腔种植体周围细菌感染的多因素 Logistic 回归分析

以上述单因素分析中有统计学意义的因素为自变量,以口腔种植体周围是否发生细菌感染为因变量,赋值见表3,建立多因素 Logistic 回归分析模型,最终分析结果显示:合并糖尿

病、种植体周围牙槽骨不良、有吸烟史、有饮酒史、有慢性牙周炎病史、口腔健康习惯不良是口腔种植体周围细菌感染的危险因素($P<0.05$),见表4。

3 讨论

口腔种植术具有稳定性佳、牢固性良好,且患者仅存在轻度的异物感和不适感等诸多优势,种植完成后还可帮助患者提高咀嚼效率^[11-13]。通常情况下,健康的种植体是不会松动的,且使用种植体时无疼痛和液体渗出。但也有研究表明^[14-16],临床中

并不乏种植失败的例子,而引起种植失败的原因通常是种植体周围细菌感染。因人体口腔环境复杂,存在多种微生物,有益菌、需氧菌、厌氧菌等微生物均处于动态平衡,维持着正常的口腔环境,而口腔种植体的植入易打破这一动态平衡,诱发细菌感染^[17-19]。

表 2 影响口腔种植体周围细菌感染的单因素分析 [例(%)]
Table 2 Univariate analysis of bacterial infection around oral implants [n(%)]

Factors	Infected group(n=35)	Uninfected group(n=325)	χ^2	P
Gender				
Male	21(60.00)	228(70.15)	1.528	0.216
Female	14(40.00)	97(29.85)		
Age(years)				
>60	12(34.29)	75(23.08)	2.179	0.141
≤ 60	23(65.71)	250(76.92)		
Body mass index(kg/m ²)				
>24	13(37.14)	86(26.46)	1.819	0.179
≤ 24	22(62.86)	239(73.54)		
History of chronic periodontitis				
Yes	26(74.29)	92(28.31)	30.318	0.000
No	9(25.71)	233(71.69)		
With diabetes mellitus				
Yes	27(77.14)	83(25.54)	39.652	0.000
No	8(22.86)	242(74.46)		
With hypertension				
Yes	19(54.29)	183(56.31)	0.052	0.819
No	16(45.71)	142(43.69)		
Smoking history				
Yes	23(65.71)	102(31.38)	4.449	0.035
No	12(34.29)	223(68.62)		
Drinking history				
Yes	22(62.86)	98(30.15)	15.207	0.000
No	13(37.14)	227(69.85)		
Planting site				
Anterior tooth area	20(57.14)	197(60.62)	0.009	0.952
Posterior tooth area	15(42.86)	128(39.38)		
Alveolar bone around implants				
Good	8(22.86)	234(72.00)	34.632	0.000
Poor	27(77.14)	91(28.00)		
Oral health habits				
Good	6(17.14)	254(78.15)	58.637	0.000
Poor	29(82.86)	71(21.85)		

本次研究结果中,纳入的患者中有 35 例发生感染,发生率为 9.72%(35/360)。略低于何詠等^[20]人报道的 427 例口腔种植患者中 10.77% 的感染率,以及滕建平等^[21]人报道的 360 例口腔种植患者中 11.39% 的感染率。为达到有效防控种植体周

围细菌感染的目的,了解患者的病原菌分布特点具有积极意义,本次研究结果中,患者感染的菌株主要以厌氧菌为主,种类主要为产黑色素普雷沃菌、口腔链球菌和牙龈卟啉单胞菌,临床可考虑以此为依据合理选择抗菌药物。

表 3 变量赋值
Table 3 Variable assignment

	Variable		Assignment
Dependent variable	Y	Bacterial infection around oral implants	0=uninfected, 1=infected
Independent variable	X1	History of chronic periodontitis	0=no, 1=yes
	X2	With diabetes mellitus	0=no, 1=yes
	X3	Smoking history	0=no, 1=yes
	X4	Drinking history	0=no, 1=yes
	X5	Alveolar bone around implants	0=good, 1=poor
	X6	Oral health habits	0=good, 1=poor

表 4 影响口腔种植体周围细菌感染的多因素 Logistic 回归分析
Table 4 Multivariate Logistic regression analysis affecting bacterial infection around oral implants

Variables	β	SE	Wald χ^2	P	OR	OR 95% confidence interval
Constant term	-0.179	0.084	4.583	0.032	-	-
History of chronic periodontitis	0.754	0.254	8.792	0.003	2.126	1.291~3.500
With diabetes mellitus	1.016	0.274	13.711	0.000	2.763	1.613~4.732
With smoking history	0.119	0.060	3.938	0.047	1.126	1.001~1.266
With drinking history	0.482	0.209	5.292	0.021	1.619	1.074~2.441
Poor alveolar bone around implants	1.077	0.338	10.155	0.001	2.937	1.514~5.698
Poor oral health habits	0.981	0.258	14.433	0.000	2.668	1.608~4.426

本研究分析结果显示,有慢性牙周炎病史、种植体周围牙槽骨不良、有饮酒史、合并糖尿病、有吸烟史、口腔健康习惯不良均是口腔种植体周围细菌感染的危险因素。有牙周病史的患者易出现种植体周围细菌感染,考虑可能是因为牙周病史的患者其牙周致病菌会从牙周袋向邻近种植体周围转移,从而影响种植成功率^[21]。糖尿病被认为是不少手术的相对禁忌症^[22-24]。陈瑞等^[25]学者的研究结果也表明,合并糖尿病的患者经口腔种植体修复后,其感染风险相对未合并糖尿病的患者明显增加。主要是由于糖尿病患者长期处于高血糖状态,存在白细胞吞噬功能和趋化功能缺陷,术后无法有效控制局部炎症反应,从而导致感染几率大大增加^[26]。现有不少研究亦认为吸烟史和饮酒史是引起种植体周围细菌感染的危险因素^[27-29]。主要是因为吸烟可减少种植体周围健康菌群,同时烟草燃烧后会释放多种毒副产物,导致机体对感染的抵抗力下降,从而提高了感染几率。而饮酒会导致人体骨质减少、骨结合进度减慢,从而延长骨折修复时间,增加感染风险。种植体周围牙槽骨不良易引发感染可能是因为,牙槽骨的质量是保障种植体植入后初期稳定的重要前提,种植体周围牙槽骨不良的患者在种植早期易引起骨吸收,导致牙槽骨骨量不足,易引发骨缺损,随着时间的延长,骨缺损严重导致种植体暴露,从而引发感染^[30]。口腔健康习惯不良会导致细菌定植于种植体周围,纠正不良的口腔卫生习惯有助于减少细菌数量,降低感染发生率。

综上所述,口腔种植体周围细菌感染病原菌以厌氧菌为主,导致口腔种植体周围细菌感染的危险因素是种植体周围牙

槽骨不良、有慢性牙周炎病史、有吸烟史、合并糖尿病、口腔健康习惯不良、有饮酒史,临床应针对此类人群进行提前干预,如针对有慢性牙周炎病史的患者积极给予牙周相关治疗、合并糖尿病患者入院后需积极控制血糖、针对有吸烟和饮酒史患者劝导其戒烟戒酒、督促患者定期进行口腔清洁养成良好卫生习惯等,通过以上积极措施来减少感染情况的发生。

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