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·综述·

牙周病与抑郁焦虑双向关联的研究进展

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【摘要】 牙周病作为一种口腔常见病，其预防与早期干预具有良好的可操作性与成本效益。抑郁症和焦虑症是两种在全球范围内具有较高发病率和自杀风险的精神疾病，其临床治疗面临干预周期长和治疗成本高等挑战。研究表明，牙周病与抑郁、焦虑之间存在双向关联，然而，目前临床实践中尚缺乏成熟的机制将两者有机结合。本文系统梳理了牙周病与抑郁症、焦虑症关联的研究进展，阐明了两者之间存在的双向作用关系，重点分析了微生物-口腔-大脑轴中的双向作用关系，既包括牙周病通过白细胞介素-1β（interleukin-1β，IL-1β）和肿瘤坏死因子-α（tumor necrosis factor-α，TNF-α）等促炎因子激活TLR-4/NF-κB信号通路诱发神经炎症，又包括抑郁、焦虑通过下丘脑-垂体-肾上腺（hypothalamic-pituitary-adrenal，HPA）轴紊乱导致"糖皮质激素抵抗"，引起免疫功能双重紊乱而加剧牙周组织破坏，以及生物-心理-社会因素在牙周病和抑郁、焦虑双向关联中的作用机制。本文提出在临床实践中建立口腔科与精神科双向转诊与筛查机制，对中重度牙周病患者进行精神健康评估[如病人健康问卷-9项（Patient Health Questionnaire-9，PHQ-9）、广泛性焦虑障碍量表-7项（Generalized Anxiety Disorder-7，GAD-7）]，精神科则将牙周检查纳入常规评估。通过多学科协作模式打破两类疾病的恶性循环，为临床医师提供切实可行的防治策略。

【关键词】 牙周病；　抑郁症；　焦虑症；　双向关联；　微生物-口腔-大脑轴；　生物-心理-社会因素；　双向转诊；　多学科协作

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Research progress on the bidirectional association between periodontal disease and depression/anxiety

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【Abstract】 There are practical and cost-effective opportunities for the prevention and early intervention of periodontal disease, a common oral condition. Depression and anxiety represent major global mental health challenges, and they are characterized by high prevalence rates and an elevated suicide risk. Their clinical management is complicated by extended treatment timelines and substantial healthcare costs. Accumulating evidence demonstrates a statistically sig-

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nificant bidirectional association between periodontal disease and depression/anxiety disorders. However, established clinical pathways integrating these conditions remain lacking. This review presents a comprehensive analysis of current research examining the relationship between periodontal disease and mood disorders, specifically depression and anxiety. This study explored the bidirectional mechanisms within the microbiota-oral-brain axis, which includes both periodontal disease inducing neuroinflammation through pro-inflammatory factors, such as interleukin-1β (IL-1β) and tumor necrosis factor-α (TNF-α) activating the TLR-4/NF-κB signaling pathway, and depression and anxiety leading to "glucocorticoid resistance" through hypothalamic-pituitary-adrenal (HPA) axis dysregulation, thus causing dual immune dysfunction that exacerbates periodontal tissue destruction, as well as the mechanisms by which biological, psychological, and social factors contribute to the bidirectional association between periodontal disease and depression/anxiety. We propose implementing bidirectional referral protocols between dental and psychiatric services in clinical practice, incorporating mental health screening tools, such as Patient Health Questionnaire-9 (PHQ-9) and Generalized Anxiety Disorder-7(GAD-7), for patients with moderate-to-severe periodontal disease, and incorporating periodontal examination into routine assessment during psychiatric services. This multidisciplinary approach aims to break the vicious circle between these conditions and provide clinicians with pragmatic intervention strategies.

【Key words】 periodontal disease; depression; anxiety; bidirectional relationship; microbiota-oral-brain axis; biopsychosocial factors; bidirectional referral; multidisciplinary approach

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全球超过35亿人正受到慢性、渐进性口腔健康问题的困扰，这类疾病通常始于儿童期并贯穿整个生命周期[1]。其中，牙周病作为口腔健康领域的重要疾病类型，因其高发性和危害性而备受关注[2]。全国流行病学数据显示，牙周病的患病率长期处于高位[3]。牙周炎是菌斑生物膜引起的炎症性疾病，主要侵袭牙龈、牙周膜、牙槽骨和牙骨质等牙周支持结构，是成年人牙齿脱落的主要原因[4-6]，它不仅直接损害咀嚼、语言功能和外貌形象[7]，还通过菌血症、炎症介质扩散等机制影响全身健康[8-10]。临床证据表明，牙周病与多种慢性疾病的风险增加有关联[11-13]，如冠心病[14-15]、呼吸系统疾病[16]、动脉粥样硬化[17]、糖尿病[18]、癌症[19-20]，以及痴呆症[21-22]。同时，抑郁症和焦虑症是两种在全球范围内具有较高发病率和自杀风险的精神疾病[23-24]，是精神疾病中伤残调整生命年（disability adjusted life years, DALYs）的第一与第二大贡献者，分别占精神疾病总DALYs的37.3%和22.9%[25]。

近年来，越来越多的研究开始聚焦于牙周病与精神疾病之间可能存在的潜在关联[26-27]。临床观察与研究数据表明，在牙周病发病率居高不下的同时，抑郁症和焦虑症的发病数据也呈现攀升趋势[28]。当前，抑郁症、焦虑症的临床治疗面临发病机制复杂、干预周期长、治疗成本高等挑战[29]，而牙周病作为口腔常见疾病，预防与早期干预具有可操作性高、成本效益高的特点[30-31]。然而，牙周炎促进抑郁焦虑疾病进展的潜在机制尚未得到系统阐明，通过牙周病预防与早期干预辅助防治抑郁焦虑的策略亦不明确。鉴于这一现实问题，本研究旨在系统梳理牙周病与抑郁症、焦虑症的双向关联研究进展，深入剖析二者交互作用的潜在机制，为构建基于牙周健康管理与精神疾病双向防治的临床路径提供理论依据，推动跨学科临床实践的创新发展。

1　牙周病与抑郁焦虑关联的临床研究进展

目前已有较多研究证据支持牙周病与抑郁焦虑的潜在关联，从早期的病例对照研究与横断面研究，到系统性的前瞻性队列分析，越来越多的证据表明两者在流行病学与生物学层面的复杂交互关系。

1.1　孟德尔随机化研究

孟德尔随机化研究基于基因型随机分配原理，为口腔疾病与抑郁焦虑的因果关系提供了新的遗传学证据。研究人员发现，重度抑郁症会增加牙周炎风险（OR = 2.15，95% CI：1.24~3.75，P = 0.01）[32]。

抑郁症的遗传易感性与多种牙周病症状密切相关，包括牙龈出血（*OR*=1.011，95% *CI*：1.003~1.020，*P*=0.008）、牙齿松动（*OR*=1.010，95% *CI*：1.005~1.014，*P*=4.65×10^{-5}）、牙龈疼痛（*OR*=1.008，95% *CI*：1.004~1.011，*P*=1.65×10^{-5}）以及慢性牙周炎（*OR*=1.332，95% *CI*：1.082~1.641，*P*=0.007）[33]。值得注意的是，虽然初步数据显示牙周炎可能增加焦虑和压力相关障碍（anxiety and stress-related disorder，ASRD）的风险，但在校正吸烟状况和教育水平等混杂因素后，这些遗传相关性不再有统计学意义[34]。这也可能由于当前使用的遗传工具变量解释力不足，需要更强大的遗传工具来验证这一研究结果。

1.2　病例对照研究

多项病例对照研究证实牙周病与抑郁情绪存在显著正相关性。具体而言，牙周病患者的抑郁量表评分和焦虑量表评分均高于健康对照组，差异有统计学意义，提示情绪障碍可能与牙周组织破坏存在潜在联系[35]。另一方面，有研究发现抑郁情绪可作为牙周病发展的独立危险因素（*OR*=1.70，95%*CI*：1.01 ~ 2.83）。相较于无抑郁症状者，抑郁症患者牙齿缺失风险增加，缺失1~7颗牙齿的*OR*值为1.305（95%*CI*：1.098~1.551），缺失15~28颗牙齿的*OR*值高达1.960（95%*CI*：1.476~2.603），且这一关联有41.7%通过不健康生活方式和3.3%通过系统性炎症反应介导[36]。然而，也有学者通过多因素分析指出，在控制年龄、吸烟等混杂变量后，心理社会因素与牙周病的关联强度不再有统计学意义[37]。基于现有证据的异质性，需采用更多高质量的前瞻性研究以进行多维度验证[21]。

1.3　横断面研究

现有横断面研究表明，牙周病与抑郁焦虑之间存在正相关趋势，但这种关联在不同人群中的表现形式受年龄、性别、地域及疾病严重程度等多因素影响。两项横断面研究表明抑郁症严重程度与牙周状况呈正相关：中度抑郁患者较轻度患者表现出更高的探诊出血比例[（79.31±25.52）% *vs*（54.71±32.07）%，*P*<0.05]和牙周袋深度[（2.79±0.63）mm *vs*（2.32±0.39）mm，*P*<0.05][38]，同时，重度牙周炎与抑郁症严重程度也呈正相关（β=0.72，95%*CI*：0.21~1.23，*P*=0.006），且两者均与炎症生物标志物白细胞介素-6（interleukin-6，IL-6）水平呈正相关（*P*<0.001）[39]。这种关联可能源于双向病理机制，即牙周致病菌的感染会导致机体产生过量的炎症因子，这些细胞因子通过体循环进入大脑并引发抑郁症，而口腔功能受损导致的社会退缩与自我形象恶化又进一步加重心理负担，形成难以解离的恶性循环[40]。

此外，人群特异性研究凸显了年龄与性别的调节作用。在年轻群体中，20~29岁确诊抑郁症者与严重牙周病呈正相关[41]，在另一研究中≤45岁人群虽未发现抑郁的独立作用，但其与吸烟的协同效应（尤其在男性）提升了牙周病风险[42]，提示行为因素（如烟草使用、口腔卫生忽视）可能是抑郁症影响牙周健康的关键通路。这一现象在女性的妊娠期中更为突出：患有牙周病的孕妇报告抑郁症状的可能性是没有牙周病孕妇的1.73倍（*OR*=1.728，95% *CI*：1.702~1.756），且抑郁作为中介变量，进一步加重了早产、低出生体重等不良妊娠结局的风险[43]。

地域差异进一步揭示了社会文化对口腔-心理关联的作用。伊朗、伊拉克研究表明抑郁症状与口腔健康指标呈正相关[35, 44-45]，这可能归因于亚洲社会学因素对口腔美观的高敏感性使得牙齿缺损更易触发心理应激；而欧洲老年人群的焦虑症状更多与牙齿缺失导致的功能性障碍相关[46]。研究表明，口腔及社会功能衰退，尤其是在说话或进食时感到的不适[47]，是牙齿缺失与抑郁症之间关联的显著中介因素。值得注意的是，焦虑症与牙周病的整体关联弱于抑郁症，但对埃及女性的研究提示，特质性焦虑可能通过慢性应激反应增加牙周病的易感性[48]，这为未来研究人格特质的调节作用提供了线索。

尽管多数证据支持牙周病与抑郁焦虑之间存在正相关，但是需警惕横断面研究在解释关联方向上的局限。此外，医疗资源可及性、患者共病等混杂因素可能部分夸大观察到的关联强度，需通过纵向设计与更严格的变量控制加以证实[35]。

1.4　队列研究

现有队列研究已证实牙周病与抑郁症之间存在双向关联，并初步揭示了潜在机制。一项基于英国人群的前瞻性队列研究表明，牙周病不仅会增加焦虑症、抑郁症的单独发病风险，还与二者共病的风险升高密切关联[49]。该研究通过多重中介分析进一步提出，系统性炎症反应可能是牙周病影响心理健康的潜在通路之一，为二者关联的生物学机制提供了直接证据。

多项跨国队列研究进一步验证了这一关联的

地域普适性。例如,针对智利人群研究发现,口腔中剩余牙齿少于20颗的个体在2年和4年随访期内抑郁症发病风险显著升高,且无牙颌状态与女性抑郁症状的严重程度呈正相关[50]。巴西的出生队列研究则从生命早期视角提供了补充证据,该研究显示青少年时期的抑郁症状与成年后牙周炎(尤其是中重度牙周炎)的发病率呈显著正相关[51]。值得注意的是,一项为期11年的回顾性队列研究在控制混杂变量后发现,牙周病可能使后续罹患抑郁的风险增加73%(*HR*=1.73,95% *CI*:1.58~1.89),这提示牙周病可能是抑郁症的独立危险因素[52]。

此外,抑郁症对牙周健康的反向影响同样不容忽视。美国前瞻性队列研究显示,抑郁与焦虑等心理问题会显著增加牙龈出血、牙齿松动等不良口腔结局的风险[53],表明心理健康与口腔健康存在双向交互作用。除直接影响外,牙周健康对认知功能的保护作用可能间接作用于心理健康。英国队列研究证实,通过防治牙周病维持牙齿功能可降低认知障碍风险,而保持良好的认知功能对延缓老年期抑郁发病具有重要价值[54]。

现有队列研究证据充分显示了牙周病与抑郁症之间的双向关联。然而,目前针对老年人群的纵向研究数据仍相对匮乏,且牙周干预措施与抑郁症状改善之间的因果影响尚未明确。未来仍需开展跨生命周期、整合多维度指标的队列研究,以进一步强化二者关系的因果推断。

2　牙周病与抑郁焦虑的共病机制

2.1　微生物-口腔-大脑轴

微生物-口腔-大脑轴揭示了口腔微生物与大脑功能的双向调控关系。这一轴系统的双向性体现在:口腔微生物通过致病菌直接定植中枢、干扰血清素代谢、引发慢性低度炎症进而引发抑郁焦虑,其中慢性低度炎症已被确认为抑郁焦虑等精神障碍的危险因素[55];而抑郁焦虑则通过下丘脑-垂体-肾上腺(hypothalamic-pituitary-adrenal, HPA)轴紊乱导致的免疫功能失衡及精神药物副作用等反作用于口腔微生物与牙周健康。

牙龈卟啉单胞菌作为牙周病的主要致病菌[56],可通过直接途径影响大脑功能。研究表明,该菌可通过血液循环或受损的血脑屏障直接迁移至中枢神经系统,引发神经退行性改变和认知功能下降[57]。已有研究证实,牙龈卟啉单胞菌诱导的慢性牙周炎小鼠表现出抑郁样行为和海马记忆缺陷,伴随突触丢失和神经发生障碍[58]。同时,它能破坏血脑屏障通透性并促进淀粉样β蛋白生成,从而建立起牙周炎与神经退行性疾病(尤其是痴呆症)的潜在关联[59]。

此外,口腔微生物群的改变还可通过影响色氨酸(血清素前体)代谢,阻碍色氨酸向血清素的转化,进而导致血清素水平下降。血清素作为神经递质,可介导神经传递,在情绪调节中起核心作用。研究发现抑郁症、焦虑症和创伤后应激障碍患者,特别是同时患有严重牙周疾病者,其血浆血清素水平普遍较低[60]。这种血清素代谢紊乱为口腔微生物直接影响精神健康提供重要证据。

炎症通路被认为是连接牙周病等慢性低度炎症疾病与精神障碍的重要纽带[61-63]。全身性慢性低度炎症已被确认为抑郁症、焦虑症和创伤后应激障碍等精神障碍的危险因素[55, 64]。牙周疾病作为慢性低度炎症的重要来源,释放的白细胞介素-1β(interleukin-1β, IL-1β)和肿瘤坏死因子-α(tumor necrosis factor-α, TNF-α)等促炎细胞因子可通过受损的血脑屏障和载脂蛋白A1(apolipoprotein A1, APOA1)介导的脂多糖(lipopolysaccharide, LPS)转运机制进入中枢神经系统,激活小胶质细胞和Toll样受体4/核因子κB(toll-like receptor 4/nuclear factor kappa-B, TLR-4/NF-κB)信号通路,进而上调诱导型一氧化氮合酶(inducible nitric oxide synthase, iNOS)、微粒体前列腺素E合酶2(microsomal prostaglandin E synthase 2, $mPGES_2$)表达,并增强磷酸化p38丝裂原活化蛋白激酶(phosphorylated p38 mitogen-activated protein kinase, p-p38),诱导前额叶皮质等情绪调节区域的神经炎症反应[63]。牙周病和抑郁症的共存导致HPA轴失调后,前额叶皮质中糖皮质激素受体(glucocorticoid receptor, GR)表达增加,同时抑制哺乳动物雷帕霉素靶蛋白(mammalian target of rapamycin, mTOR)的磷酸化[63],可能影响神经元细胞存活。这一炎症过程与抑郁症和焦虑症[65]以及创伤后应激障碍(post-traumatic stress disorder, PTSD)[66]的发病密切相关。

同时,抑郁焦虑也可通过微生物-口腔-大脑轴影响牙周健康。抑郁症和焦虑症患者在慢性心理压力作用下,通过HPA轴功能紊乱,诱发皮质醇水平异常升高,这一过程涉及免疫功能的复杂重塑。急性应激状态下,升高的皮质醇通过与免疫

细胞表面GR结合，可短期内抑制IL-1、IL-6、TNF-α等促炎细胞因子的过度释放以避免炎症反应失控；但在抑郁焦虑伴随的慢性压力长期作用下，持续高皮质醇暴露会引发免疫功能的双重紊乱[67-68]：一方面，持续高皮质醇会直接抑制免疫细胞增值与功能，产生免疫抑制效应，表现为淋巴细胞数量减少、自然杀伤细胞活性下降和抗体产生减少，使机体对抗感染的能力下降，导致牙周致病菌难以被清除。另一方面，长期的高皮质醇水平可能导致糖皮质激素受体下调或功能受损，形成“糖皮质激素抵抗”，导致免疫激活异常。这时正常抗炎作用失效，促炎细胞因子（IL-1、IL-6、TNF-α）不受控释放，从而加剧破坏牙周组织。对于这类患者，单纯的机械治疗往往效果有限，可能需要考虑抗生素治疗以获得更好的临床效果[69-70]。抗精神病药和抗抑郁药会干扰参与唾液分泌调节的自主神经系统（autonomic nervous system，ANS）信号[71]，造成唾液分泌量减少、流速降低，进而引发口干，为口腔致病菌的增殖创造条件[72]（图1）。

微生物-口腔-大脑轴形成口腔与大脑之间的复杂调控网络，揭示了口腔微生物与大脑功能和精神健康的双向调控关系。这一概念强调口腔不仅是简单的消化道入口，更是连接微生物群落与神经系统的重要界面，通过多重分子与细胞途径介导微生物信号与神经功能的相互影响。这种相互作用类似于肠道的屏障功能障碍，通过口腔独特的生理结构形成的微生物渗透通路，成为联系口腔健康与脑功能的关键机制[73]。

2.2　生物-心理-社会机制

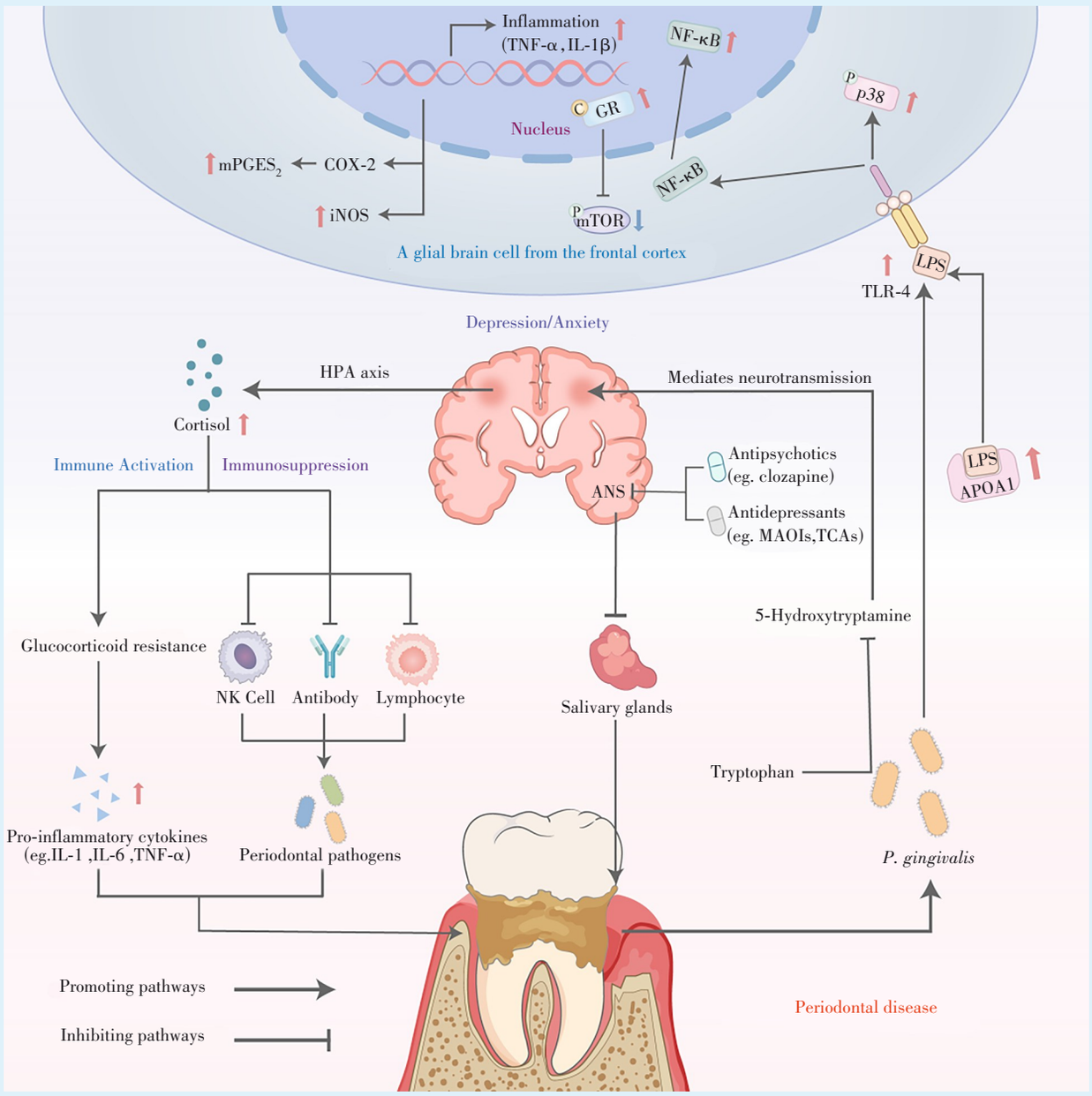
除微生物-口腔-大脑轴外，牙周病还可能通过多种生物-心理-社会机制影响精神健康（图2）。牙周病的影响范围远超生理症状本身，更会导致机体功能受限和社会心理健康受损[74]。这种影响主要通过两条路径显现：直接路径表现为咀嚼困难和疼痛等生理症状，进而引发进食减少和体重下降；间接路径则涉及心理社会机制，包括自我表达、沟通能力和面部美观度的受损[75]。这种损害常引发“社交残疾"[76]，即患者出现隐藏行为、焦虑情绪、自尊心下降以及社交退缩，当口腔异味和明显牙周病体征引发耻辱感时反应更为显著。口腔健康问题导致的功能障碍（如说话困难、进食不适）已被证实与抑郁症状呈正相关[77]，进一步支持了牙周病通过影响口腔功能进而损害社交能力和心理健康的观点。而抑郁症状恶化与因牙齿或假牙问题限制与他人接触呈负相关[78]，表明社交回避行为可能是抑郁与口腔健康相关生活质量关联的重要中介因素。

牙周病患者中抑郁和焦虑的发生率极高，分别可达38%和40%[79]。这种关联形成恶性循环：一方面，牙周病本身的慢性疼痛、口腔异味和自我表达受限可诱发牙科恐惧，导致患者治疗依从性下降、延迟就诊，进一步加剧心理负担，促进抑郁焦虑进展[80]；另一方面，抑郁和焦虑本身也是牙周病的重要驱动因素。疾病认知不佳、消极应对方式和牙科恐惧等因素均与牙周病患者的抑郁焦虑密切相关[81]。抑郁焦虑可通过多种方式损害口腔健康：执行功能损害（如工作记忆障碍、动机减退）使患者难以维持规律口腔护理[72]。研究表明，抑郁症患者每日刷牙不足1次比例达58%，显著高于健康对照组的12%；牙科恐惧导致焦虑症患者回避就诊的比例高达40%，显著降低牙周病早期检出率[81]；社会功能障碍、社会支持减少及健康素养不足间接影响口腔保健行为和就医决策[69]。这最终导致精神健康状况较差的人群往往有更多未满足的口腔健康需求，其中牙周病和龋病最为常见[82]。

结构方程模型证实，焦虑在心理压力与牙龈出血等牙周相关疾病间起重要中介作用，表明精神压力可诱发焦虑进而影响口腔健康[83]。高度心理压力与口干症报告率呈正相关，而良好的心理应对能力则可降低其风险[84]。此外，心理社会压力可能促使个体采用物质使用（如增加酒精和烟草滥用风险）作为应对策略[85]。抑郁症和焦虑症可能在口腔健康问题与物质使用障碍的关系中起中介作用：口腔健康问题增加抑郁焦虑风险，而后者又促进物质依赖[86-87]；同时，抑郁焦虑患者通过忽视口腔卫生导致菌斑积聚，或增加烟酒使用，直接促进牙周病的发生发展[67, 88]。社会经济地位（socioeconomic position，SEP）的研究为此提供了宏观视角：SEP不仅与心理健康（包括抑郁症状）直接相关，还通过影响口腔健康行为和就诊行为间接作用于口腔健康[89]。

3　小结与展望

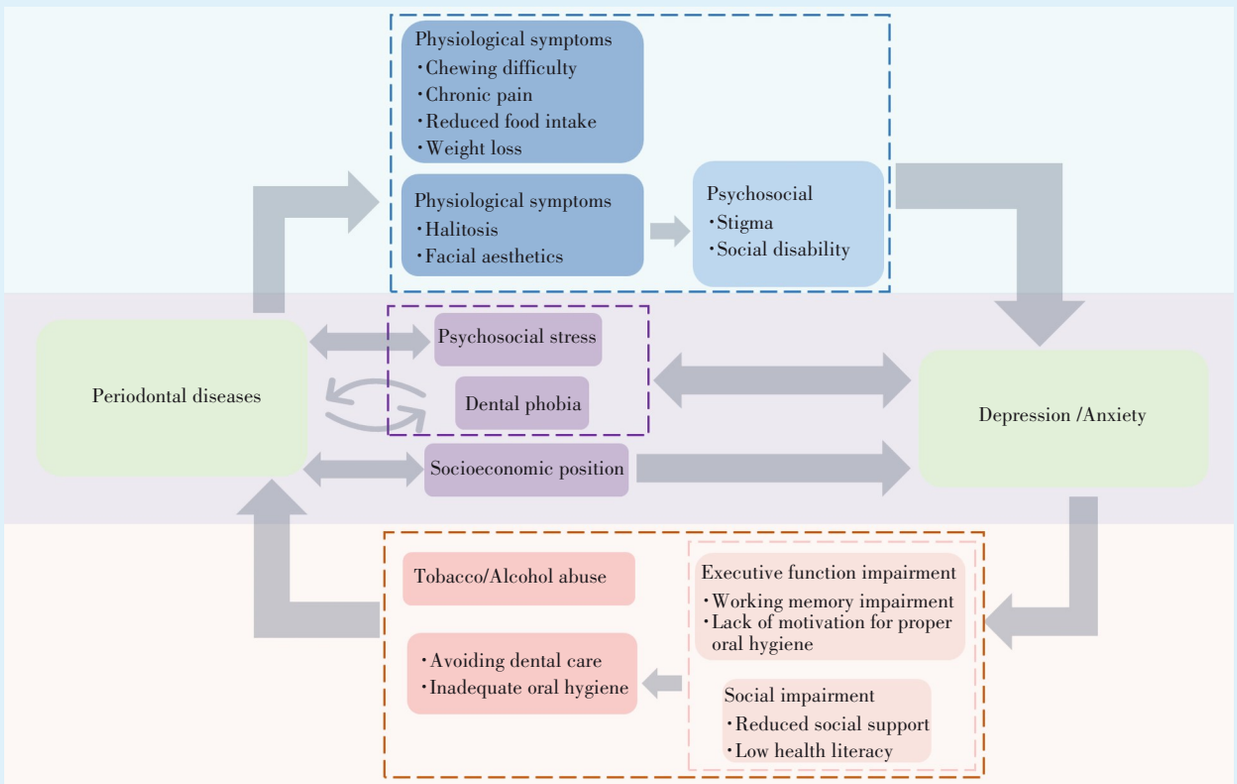
牙周病与抑郁焦虑存在一定的双向关联，二者通过微生物-口腔-大脑轴以及生物-心理-社会机制形成交互作用。多项研究通过孟德尔随机化、病例对照、横断面研究及队列研究，从不同维



Periodontal disease to depression/anxiety pathway: *P. gingivalis* reduces serotonin by altering tryptophan metabolism. LPS transported by APOA1 crosses the blood-brain barrier, activating TLR-4 in frontal cortex glial cells. This triggers NF-κB signaling and p38 phosphorylation, upregulating inflammatory mediators, namely, TNF-α, IL-1β, COX-2, $mPGES_2$, and iNOS, while inhibiting mTOR phosphorylation, thus ultimately contributing to depression/anxiety. Depression/anxiety to periodontal disease pathway: chronic stress activates the HPA axis, elevating cortisol levels. Cortisol causes dual immune dysregulation: immunosuppression (reduced lymphocyte count, NK cell activity, and antibody production) and abnormal immune activation due to glucocorticoid resistance, leading to uncontrolled release of pro-inflammatory cytokines, namely, IL-1, IL-6, and TNF-α. In addition, psychotropic medications (antipsychotics, such as clozapine, and antidepressants, such as MAOIs and TCAs) interfere with ANS signaling involved in salivary regulation, collectively accelerating periodontal disease progression. ANS: autonomic nervous system; APOA1: apolipoprotein-A1; COX-2, cyclooxygenase-2; GR: glucocorticoid receptor; HPA axis: hypothalamic-pituitary-adrenal axis; IL-1: interleukin-1; IL-1β: interleukin-1 beta; IL-6: interleukin-6; iNOS: inducible nitric oxide synthase; LPS: lipopolysaccharide; MAOIs: monoamine oxidase inhibitors; $mPGES_2$: microsomal prostaglandin E synthase 2; mTOR: mammalian target of rapamycin; NF-κB: nuclear factor kappa-B; *P. gingivalis*: *Porphyromonas gingivalis*; TCAs: tricyclic antidepressants; TLR-4: toll-like receptor 4; TNF-α: tumour necrosis factor-alpha; p-p38: phosphorylated p38 mitogen-activated protein kinase

Figure 1　Molecular mechanisms of bidirectional interaction between periodontal disease and depression/anxiety

图1　牙周病与抑郁/焦虑双向作用的分子机制



Periodontal disease impacts depression/anxiety through dual pathways: physiological symptoms, such as chewing difficulty, chronic pain, reduced food intake, and weight loss, and halitosis and facial aesthetics that trigger psychosocial consequences. These combined physical limitations and social impacts promote depression/anxiety. Depression/anxiety compromises periodontal disease through executive function impairment and social impairments; these impairments lead to inadequate oral hygiene and dental care avoidance. Together with increased tobacco/alcohol use as coping mechanisms, these factors collectively lead to the deterioration of periodontal health. Psychosocial stress, dental phobia, and socioeconomic position serve as bidirectional mediators, creating a self-reinforcing cycle in which depression/anxiety and periodontal disease continually exacerbate each other through biological, psychological, and social mechanisms

Figure 2　Biopsychosocial interaction mechanisms between periodontal disease and depression/anxiety

图2　牙周病与抑郁/焦虑的生物-心理-社会相互作用机制

度证实关联的客观存在。常见精神障碍[69, 90]可能共享生物发病机制[61-63]，牙周病或可诱发多种精神类共病[91-93]，但相关研究仍存在空白。目前研究仍存在两个关键科学问题亟待解决：①多数研究采用横断面设计，难以明确因果时序关系，且缺乏牙周干预对精神疾病影响的长期随访数据；②微生物-神经免疫交互机制尚未完全阐明，如致病菌入脑路径及血清素代谢与菌群关系尚不明确，制约了临床转化应用。

尽管存在局限，现有证据仍支持牙周治疗的临床转化价值。牙周治疗能减轻口腔炎症[94]、降低促炎因子水平[95-96]，从而对神经炎症过程产生抑制作用，并作为非药物干预手段改善患者社交功能[76]。在精神疾病预防干预措施匮乏的背景下[97]，口腔健康管理展现出独特的战略价值[98]。流行病学数据显示，系统性的牙周病预防可显著降低焦虑抑郁的风险，尤其在神经发育关键期的儿童青少年群体中效果更显著[99]。牙周病防控纳入精神卫生防治体系具有双重效益：阻断微生物-口腔-大脑轴，减轻神经炎症，并通过健康行为改善社会心理功能[100]。据此，构建牙周病与抑郁焦虑双向筛查机制对于心理-生理共病管理模式革新具有重要意义，即口腔科对中重度牙周病患者实施病人健康问卷-9项（Patient Health Questionnaire-9，PHQ-9）、广泛性焦虑障碍量表-7项（Generalized Anxiety Disorder-7，GAD-7）等标准化精神量表筛查，精神科则将牙周检查纳入常规评估。建立口腔与精神医学跨学科协作模式[101]，有望减轻双重疾病负担，提高患者生活质量，为共病管理开创路径。

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