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膝骨关节炎患者磁共振成像骨髓病变的检出率及其影响因素分析*

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摘要 目的:研究膝骨关节炎(KOA)患者磁共振成像(MRI)骨髓病变(BML)的检出率及其影响因素。方法:选择从2015年1月到2017年12月在我院接受诊治的KOA患者182例进行研究。对患者实施MRI诊断,统计KOA患者BML的检出率及病变发生位置,并应用单因素分析和Logistic回归分析KOA患者发生BML的影响因素。结果:182例KOA患者共检出92例BML,检出率为50.55%。其中BML发生在外侧股骨、内侧股骨以及外侧胫骨、内侧胫骨的构成比均超过22.00%,检出率均超过11.00%。单因素分析显示,KOA患者发生BML与年龄、体质指数(BMI)、病程、吸烟频率及饮酒频率等因素有关($P<0.05$)。根据Logistic回归分析可知,KOA患者发生BML的影响因素主要包括年龄 ≥ 60 岁、BMI ≥ 24 kg/m²、病程 ≥ 5 年、吸烟频率 ≥ 10 支/d以及饮酒频率 ≥ 4 次/周($P<0.05$)。结论:KOA患者BML检出率较高,且影响BML发病的因素较多,临床上可从患者的年龄、BMI、病程、吸烟频率以及饮酒频率等方面进行考察,从而有助于患者病情进展的评估和后续诊治工作的进行。

关键词:膝骨关节炎;磁共振成像;骨髓病变;检出率;影响因素

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Analysis of Detection Rate of Bone Marrow Lesions with MRI and Its Influence Factors in Patients with Knee Osteoarthritis*

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ABSTRACT **Objective:** To study the detection rate of bone marrow lesion (BML) with magnetic resonance imaging (MRI) and its influence factors in patients with knee osteoarthritis (KOA). **Methods:** A total of 182 patients with KOA, who were treated in First Affiliated Hospital of Chengdu Medical College from January 2015 to December 2017, were selected and were detected with MRI. The detection rate and location of BML in the patients with KOA were statistically analyzed. Single factor analysis and Logistic regression analysis were used to evaluate the influence factors of BML in the patients with KOA. **Results:** Among 182 patients with KOA, 92 patients had BML, and the detection rate was 50.55%, in which, the constituent ratio of BML in lateral femur, medial femur, lateral tibia and medial tibia was more than 22.00%, the detection rate was higher than 11.00%. Single factor analysis showed that the incidence of BML in the patients with KOA was related to age, body mass index (BMI), course of disease, smoking frequency and drinking frequency ($P<0.05$). According to Logistic regression analysis, the main influence factors of BML in the patients with KOA were age ≥ 60 years old, BMI ≥ 24 kg/m², course of disease ≥ 5 years, smoking frequency ≥ 10 pieces/d and drinking frequency ≥ 4 times/week ($P<0.05$). **Conclusion:** KOA patients have higher detection rate of BML, and there are many factors affecting the incidence of BML. It should be investigated from the aspects of age, BMI, course of disease, smoking frequency and drinking frequency, which is helpful for the evaluation of patients' progress and subsequent diagnosis and treatment.

Key words: Knee osteoarthritis; Magnetic resonance imaging; Bone marrow lesion; Detection rate; Influence factor

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前言

膝骨关节炎(knee osteoarthritis, KOA)是由多种因素引起的一类关节软骨不断损失的膝关节病变,主要引起软骨下骨质增生及软骨剥离等症状,进而破坏膝关节的解剖结构,最终影响患者的膝关节功能^[1-3]。KOA在临床上十分常见,其主要的临

床表现包括膝关节疼痛和畸形以及骨髓病变(bone marrow lesion, BML)等,对患者的生活质量具有不良影响,因此,早期诊断KOA意义重大^[4,5]。磁共振成像(magnetic resonance imaging, MRI)对于KOA的诊断具有较高的敏感度和特异度,且有报道证实MRI被应用于诊断KOA时可发现患者是否合并BML的情况^[6,7]。由于KOA合并BML的治疗难度较大,因此早期发现

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KOA 患者合并 BML 的潜在诱因及发病情况显得尤为必要^[9]。鉴于此,本研究通过 MRI 诊断显示 KOA 患者 BML 的检出率,并分析导致 BML 的影响因素,旨在为临床的诊治过程提供相应的研究思路和数据支持,现报道如下。

1 资料和方法

1.1 一般资料

选择从 2015 年 1 月到 2017 年 12 月在我院接受诊治的 KOA 患者 182 例进行研究。纳入标准:(1)所有患者均符合美国风湿病学学会制定的有关 KOA 的诊断标准^[9];(2)均经关节镜手术证实;(3)积极配合者;(4)患者或其家属对本次研究知情同意,且签署知情同意书。排除标准:(1)有强直性脊柱炎或风湿、痛风等疾病者;(2)存在心、肝、肾等脏器功能性障碍者;(3)有恶性肿瘤者;(4)有血液系统类疾病者;(5)检查前 1 个月内应用过糖皮质激素类药物亦或是非甾体抗炎类药物者。其中男 36 例,女 146 例;年龄 32-75 岁,平均(58.24±2.13)岁;病程 1-8 年,平均(4.32±0.21)年;体质量指数(body mass index, BMI):≥24 kg/m² 有 80 例,<24 kg/m² 有 102 例;合并骨质疏松:有 81 例,无 101 例;WOMAC 积分:≥80 分 88 例,<80 分 94 例;吸烟频率:≥10 支/d 57 例,<10 支/d 125 例;饮酒频率:≥4 次/周 64 例,<4 次/周 118 例;锻炼频率:≥3 次/周 61 例,<3 次/周 121 例;血沉(erythrocyte sedimentation rate, ESR)水平:≥20 mm/h 84 例,<20 mm/h 98 例;C 反应蛋白(C reactive protein, CRP)水平:≥3 mg/L 90 例,<3 mg/L 92 例;总胆固醇(cholesterol total, TC)水平:≥5.2 mmol/L 101 例,<5.2 mmol/L 81 例;甘油三酯(glycerin trilaurate, TG)水平:≥1.7 mmol/L 98 例,<1.7 mmol/L 84 例;高密度脂蛋白(high density lipoprotein, HDL)水平:≥1.04 mmol/L 96 例,<1.04 mmol/L 86 例。本研究已经得到了我院伦理委员会的评审通过。

1.2 研究方法

1.2.1 患者的信息资料收集 收集所有患者的病历及诊断资料,统计并调查患者的以下数据信息:①性别;②年龄;③BMI;④病程;⑤骨质疏松情况;⑥WOMAC 积分;⑦吸烟频率;⑧饮酒频率;⑨锻炼频率;⑩ESR、CRP、TC、TG、HDL 水平。其中 WOMAC 积分评分表共 24 项,含 5 项的疼痛评分、2 项的僵硬感评分以及 17 项的关节功能评分。分别在患者入组前的晨间抽取其空腹静脉血 4 mL,给予 10 min 3000 r/min 的离心之后将血清分离,利用贝克曼 AU480 型全自动生化分析仪检测 ESR、CRP、TC、TG 及 HDL 水平。有关试剂均购自湖北武汉的博士德公司,操作时严格遵照说明书的步骤进行。

1.2.2 MRI 诊断 BML 及有关诊断标准 应用西门子 1.5T 磁共振进行 MRI 诊断,所用序列分别是斜矢状面的 T1WI 和 T2WI 及 STIR 序列、冠状面的 T1WI 和 STIR 序列以及横断面的 T1WI,三维扰相的脂肪抑制梯度的回波序列。有关参数设置:T1WI:TR 为 500 ms,TE 为 20 ms;T2WI:TR 为 300 ms,TE 为 90 ms;STIR:TR 为 400 ms,TE 为 100 ms;层厚为 4.0 mm,间距为 1.0 mm,视野为 16.0 cm,矩阵为 256×256,使斜矢状面和前交叉韧带保持平行。BML 的评价按照股骨远端亦或是胫骨近端的 T2 加权成像的 MRI 强信号区进行判断。

1.3 统计学方法

通过 SPSS21.0 统计软件实施数据的处理分析,计数资料用(n,%)表示,其比较采用 χ^2 检验。计量资料用($\bar{x} \pm s$)表示,其比较采用 t 检验。采用 Logistic 回归分析 KOA 患者发生 BML 的影响因素,以 P<0.05 为差异有统计学意义。

2 结果

2.1 KOA 患者 BML 的检出率分析

182 例 KOA 患者共检出 92 例 BML,其检出率为 50.55%。其中 BML 发生在外侧股骨、内侧股骨以及外侧胫骨、内侧胫骨的构成比均超过 22.00%,检出率均超过 11.00%,见表 1。

表 1 KOA 患者 BML 的检出率分析

Table 1 Analysis of detection rate of BML in patients

Lesion location	Number of detection	Constituent ratio(%)	Detection rate(%)
Lateral femur	21	22.83	11.54
Medial femur	22	23.91	12.09
Lateral tibia	24	26.09	13.19
Medial tibia	25	27.17	13.74
Total	92	100.00	50.55

2.2 KOA 患者发生 BML 的单因素分析

KOA 患者发生 BML 与年龄、BMI、病程、吸烟频率及饮酒频率等因素有关(P<0.05),而与性别、骨质疏松情况、WOMAC 积分、锻炼频率、ESR、CRP、TC、TG 及 HDL 水平等因素无关(P>0.05),见表 2。

2.3 KOA 患者发生 BML 的 Logistic 回归分析

根据 Logistic 回归分析可知,KOA 患者发生 BML 的影响因素主要包括年龄≥60 岁、BMI≥24 kg/m²、病程≥5 年、吸烟频率≥10 支/d 以及饮酒频率≥4 次/周,见表 3。

3 讨论

膝关节是 KOA 患者最为常见的损伤部位,近年来的流行病学数据统计显示,KOA 在我国的发病率较高,对 KOA 患者实施早期诊断并进行科学的治疗对其预后具有重要的意义^[10,11]。当前临床应用的诊断方式中,X 线和 CT 等措施虽可发现 KOA 患者关节结构的改变,但由于此类检测措施会受到体位的限制,因此其组织分辨率往往较低,易产生一定程度的测量误差^[12,13]。伴随 MRI 技术的逐渐成熟,MRI 已被广泛地应用到

针对 KOA 患者的软骨缺损及骨髓病变的诊断检测过程中^[14,15]。床诊断以及治疗存在较大影响,因此,分析 KOA 患者 BML 的以往相关报道大都只重视 MRI 对于 KOA 患者 BML 的检出结果,较少深入分析 BML 的影响因素,而此种因素对于患者的临

表 2 KOA 患者发生 BML 的单因素分析[n(%)]
Table 2 Single factor analysis of BML in patients with KOA[n(%)]

Influence factors		n	BML incidence	χ^2	P
Age(years old)	≥ 60	90	62(68.89)	23.956	0.000
	<60	92	30(32.61)		
Gender	Male	36	18(50.00)	0.005	0.941
	Female	146	74(50.68)		
BMI(kg/m ²)	≥ 24	80	69(86.25)	72.782	0.000
	<24	102	23(22.55)		
Course of disease (years)	≥ 5	89	71(79.78)	59.515	0.000
	<5	93	21(22.58)		
Combined osteoporosis	Yes	81	36(44.44)	2.176	0.140
	No	101	56(55.45)		
WOMAC score(scores)	≥ 80	88	41(46.59)	1.068	0.301
	<80	94	51(54.26)		
Smoking frequency (pieces/d)	≥ 10	57	48(84.21)	37.619	0.000
	<10	125	44(35.20)		
Drinking frequency (times/week)	≥ 4	64	45(70.31)	15.424	0.000
	<4	118	47(39.83)		
Exercise frequency (times/week)	≥ 3	61	37(60.66)	3.749	0.053
	<3	121	55(45.45)		
ESR(mm/h)	≥ 20	84	43(51.19)	0.026	0.873
	<20	98	49(50.00)		
CRP(mg/L)	≥ 3	90	40(44.44)	2.655	0.103
	<3	92	52(56.52)		
TC(mmol/L)	≥ 5.2	101	45(44.55)	3.263	0.071
	<5.2	81	47(58.02)		
TG(mmol/L)	≥ 1.7	98	48(48.98)	0.209	0.647
	<1.7	84	44(52.38)		
HDL(mmol/L)	≥ 1.04	96	50(52.08)	0.191	0.662
	<1.04	86	42(48.84)		

表 3 KOA 患者发生 BML 的 Logistic 回归分析
Table 3 Logistic regression analysis of BML in patients with KOA

Influencing factors	B	SE	Wald χ^2	P	OR	95%CI
Age ≥ 60 years old	0.579	0.684	4.631	0.028	1.398	0.840~2.399
BMI ≥ 24 kg/m ²	0.872	0.863	5.219	0.020	1.961	1.239~3.592
Course of disease ≥ 5 years	1.340	0.782	8.949	0.000	3.288	1.063~7.680
Smoking frequency ≥ 10 pieces/d	0.442	0.529	3.950	0.041	1.069	0.537~2.184
Drinking frequency ≥ 4 times/week	0.613	0.598	4.629	0.033	1.325	0.706~2.152

本研究结果显示,182 例 KOA 患者共检出 92 例 BML,其检出率为 50.55%。其中 BML 发生部位在外侧股骨、内侧股骨以及外侧胫骨、内侧胫骨,这提示了 KOA 患者通常具有较高的 BML 发生率,同时发病区域在内、外侧的胫骨和股骨区域均可发生。BML 存在的位置较为特殊,其发病区域不具有特异性,可在 KOA 患者的股骨或胫骨的各区域发病,因此应用 MRI 检测 BML 显示在股骨和胫骨的检出率相近^[19,21]。同时,MRI 诊断能够获得 KOA 患者的膝关节处电磁信号,进而可较好地掌握其软骨的钙化程度、软骨下骨小梁的解剖情况以及关节腔积液情况,并可对膝关节的任意方向断层实施三维扫描,并且此种诊断不会因患者的体位的不同而产生影响^[22,23]。事实上,通过股骨远端亦或是胫骨近端的 T2 加权图像显示的 MRI 强信号区以判断 BML,能够有效鉴别 KOA 患者是否伴有 BML^[24,25]。此外,本研究还发现,KOA 患者发生 BML 与年龄、BMI、病程、吸烟频率及饮酒频率等因素有关,而与性别、骨质疏松情况、WOMAC 积分、锻炼频率、ESR、CRP、TC、TG 及 HDL 水平等因素无关。Logistic 回归分析可知,KOA 患者发生 BML 的影响因素主要包括年龄 ≥ 60 岁、BMI ≥ 24 kg/m²、病程 ≥ 5 年、抽烟频率 ≥ 10 支/d 以及饮酒频率 ≥ 4 次/周,这提示了上述五项因素均可能致使 KOA 患者发生 BML。老年 KOA 患者的骨质细胞功能明显下降,且年龄的增加易导致患者病灶周围细胞线粒体的 DNA 产生突变,使得细胞氧化及磷酸化的过程发生障碍,进而影响细胞呼吸和能量的生成,最终容易引起 BML^[26,27]。BMI 水平越高的 KOA 患者其膝关节承受的重量也随之增高,较易引起软骨损伤,最终导致 BML。有报道指出^[28],BMI 处于正常基线水平的 KOA 患者,当其 BMI 每升高 1 kg/m² 时,接受全膝关节置换治疗的风险也增大 10.5%。病程越长的 KOA 患者,其膝关节损伤的程度相对严重,发生 BML 的几率明显更高^[29]。过量的吸烟及饮酒产生的不良生活习惯较易破坏 KOA 患者的骨质,最终较易引发 BML^[30]。临床上可根据 KOA 患者 BML 水平预测其病情的严重程度,同时对存在 KOA 的患者可从改善饮食及生活不良习惯进行病情的控制,以预防 BML 的发生。

综上所述,KOA 患者经 MRI 诊断显示,BML 检出率较高,且发生 BML 的影响因素主要包含年龄 ≥ 60 岁、BMI ≥ 24 kg/m²、病程 ≥ 5 年、吸烟频率 ≥ 10 支/d 以及饮酒频率 ≥ 4 次/周等,临床上应关注 KOA 患者的上述影响因素情况,从而为预防 BML 提供指导意见。

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