

肌骨超声在类风湿关节炎和痛风性关节炎患者 有症状关节病变诊断中的作用比较

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摘要 **目的** 应用肌骨超声(MSUS)比较类风湿关节炎(RA)和痛风性关节炎(GA)有症状关节病变的超声征象。**方法** 回顾性分析85例RA住院患者和同期55例GA住院患者,比较两组一般资料、病变关节情况及超声征象的差异。**结果** 两组性别、年龄段、病变关节情况比较差异均有统计

学意义(均 $P < 0.05$);膝关节病变检出率均最高;RA组滑膜炎灵敏度、半月板损伤特异度高、骨侵蚀诊断效能高,GA组点状强回声、双轨征、痛风石3项联合超声征象诊断效能高于任一项单独诊断且灵敏度和特异度也较高;RA组病程与骨侵蚀呈正相关($P < 0.05$),GA组病程与痛风石呈正相关($P < 0.05$)。**结论** RA与GA的超声征象具有一定差异,MSUS在二者诊断及鉴别诊断上具有较好价值。

关键词 肌骨超声;类风湿关节炎;痛风性关节炎;关节病变;诊断

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类风湿关节炎(rheumatoid arthritis, RA)是一种主要影响关节的多器官、多系统受累的免疫性疾

and heart failure and all-cause death in patients with end-stage renal disease (ESRD). **Methods** The prospective cohort study design was used in the present study. The ESRD patients who were admitted to the department of nephropathy in the Hospital and without heart failure symptoms were recruited in this study. The data of patients was collected through baseline questionnaires, physical examinations, echocardiography, and laboratory examinations. The serum FGF23 levels were measured by enzyme-linked immunosorbent assay (ELISA). The follow-up time was 2 years. The onset of heart failure (ACC/AHA stage C-D) and all-cause death were composite endpoint events. The Cox proportional risk model was used to explore the risk factors of outcome events. Through subgroup analyses and interaction analyses, further exploration was conducted to determine whether there was heterogeneity in the association between FGF23 and outcome events in different subgroups. **Results** Ultimately, 107 ESRD patients were included in this study, with an average age of (52.00 ± 12.51) years. There were 39 males (36.45%), and the median follow-up time was 23 months (21, 25 months). There were 32 (29.9%) outcome events, of which 22 (20.6%) onset of heart failure and 10 (9.3%) all-cause of deaths. The results of this study showed that the concentration of FGF23 in the outcome event group was significantly higher than that in the non-event group [(4.40 ± 1.16) pmol/ml vs (3.85 ± 0.82) pmol/ml, $P < 0.05$]. The Cox proportional risk model showed that the elevated FGF23 was associated with increased risk of the composite endpoint events in ESRD patients ($HR = 1.730$, 95% $CI: 1.164 - 2.570$, $P = 0.007$). Subgroup analyses showed that there was an interactive effect between FGF23 levels and gender on the risk of cardiovascular outcome events. Especially in male ESRD patients, the increased FGF23 level was correlated with a higher risk of cardiovascular events ($P_{-interaction} < 0.05$). **Conclusion** Elevated serum FGF23 is an independent risk factor for the onset of heart failure and all-cause of mortality in ESRD patients, especially in male patients.

Key words end-stage renal disease; fibroblast growth factor-23; heart failure; all-cause of death; prospective cohort study

病^[1]。痛风性关节炎(gouty arthritis, GA)是由慢性高尿酸血症导致的炎症性关节炎^[2]。这两种疾病的临床主诉一般均是有症状关节肿痛病史,若不恰当处理,严重者可导致关节功能丧失。因此,辅助检查对确定治疗方案尤为重要。肌骨超声(musculoskeletal ultrasound, MSUS)可以有效评估肌肉骨骼创伤和感染^[3]。该研究旨在探讨 RA 和 GA 有症状关节病变特点及 MSUS 在二者鉴别诊断中的应用价值。

1 材料与方法

1.1 病例资料 回顾性选取 2020 年 9 月—2023 年 2 月就诊于安徽医科大学第一附属医院风湿科并进行有症状关节(有关节肿痛病史)超声检查的 85 例 RA 患者和同期 55 例 GA 患者。纳入标准:符合 1987 年美国风湿病学会(american college of rheumatology, ACR)修订的 RA 分类诊断标准及 2010 年 ACR 与欧洲抗风湿病联盟(european league against rheumatism, EULAR)提出的 RA 最新分类诊断标准^[4];或符合 2015 年 ACR 与 EULAR 提出的 GA 诊断标准^[5]。排除标准:合并有 RA 和 GA;合并其他免疫系统疾病或其他类型的关节炎;合并各种感染性疾病或伴有其他传染性疾病;近期服用免疫抑制剂或激素;先天性关节畸形或关节外伤。该研究已获得安徽医科大学第一附属医院临床医学研究伦理委员会批准,免除知情同意书(批准号:PJ2023-06-43)。

1.2 检查方法 体格检查:按照临床常规检查程序进行,对手指关节、腕关节、肘关节、肩关节、膝关节、踝关节及足趾关节等关节进行检查,明确具体有关节压痛(在关节边缘或触及韧带时重压疼痛)、关节肿胀(有软组织肿胀)的有症状关节。

MSUS 检查:纳入研究对象的患者都在入院后 1 周内由同一位具有丰富 MSUS 检查经验的超声医师进行检查,并记录两组患者声像图的具体超声声像。选择的设备是 Mindray Resona 7S 型超声诊断仪(深圳迈瑞生物医疗电子股份有限公司),配有 8~12 MHz 线阵变频探头,采用 MSUS 检查条件。对有症状的关节部位进行扫查,每一部位均行纵切面和横切面扫描,必要时加做侧方扫描。

1.3 统计学处理 采用 SPSS 23.0 软件对所有数据进行统计学分析。计数资料采用 $n(\%)$ 表示;组间比较选择 χ^2 检验;获得所有参数后绘制受试者工作特征曲线(receiver operating characteristic curve, ROC)曲线,并计算曲线下面积(area under the

curve, AUC)、95% 置信区间(confidence interval, CI)及灵敏度、特异度;相关性分析应用点双列相关检验,属于 Pearson 检验的特殊情况。均以 $P < 0.05$ 为差异有统计学意义。

2 结果

2.1 一般资料和病变关节特点比较 该研究共纳入 140 例患者,其中 RA 组 85 例,GA 组 55 例。两组性别、年龄段、病变关节情况比较差异均有统计学意义(均 $P < 0.05$)。RA 好发于中老年女性,GA 好发于青中年男性;RA 大多呈多关节、对称性受累,GA 多数仅累及单关节。见表 1。

表 1 两组一般资料和病变关节特点比较

变量	组别 [$n(\%)$]		χ^2 值	P 值
	RA 组	GA 组		
性别			72.060	<0.001
男	15(17.6)	50(90.9)		
女	70(82.4)	5(9.1)		
年龄(岁)			14.301	0.001
≤ 44	9(10.6)	20(36.4)		
45~59	34(40.0)	19(34.5)		
≥ 60	42(49.4)	16(29.1)		
单关节或多关节病变			5.907	0.015
单关节	41(48.2)	38(69.1)		
多关节	44(51.8)	17(30.9)		
对称性或非对称性			8.310	0.004
对称	49(57.6)	18(32.7)		
非对称	36(42.4)	37(67.3)		

2.2 有症状关节病变分布情况 受检的有症状关节包括手指关节、腕关节、膝关节、足趾关节、踝关节、肘关节、肩关节,RA 组的膝关节病变检出率(62.4%)与 GA 组的膝关节病变检出率(63.6%)均最高。见表 2。

2.3 有症状关节病变超声征象 RA 组腱鞘炎、滑膜炎、骨侵蚀、骨赘、半月板损伤、腓窝囊肿检出率高于 GA 组,GA 组点状强回声、双轨征、痛风石检出率高于 RA 组,差异均有统计学意义(均 $P < 0.05$)。见表 3 和图 1。

2.4 超声征象的诊断效能及 ROC 曲线 RA 组滑膜炎灵敏度高达 96.5%,半月板损伤特异度高达 81.8%,骨侵蚀曲线下面积 AUC 为 0.682 高于其他各项诊断;GA 组点状强回声、双轨征、痛风石 3 项联合超声征象灵敏度和特异度均高达 80% 以上,且联合诊断的 AUC 为 0.903 高于 3 项单独诊断。见表 4、5 和图 2。

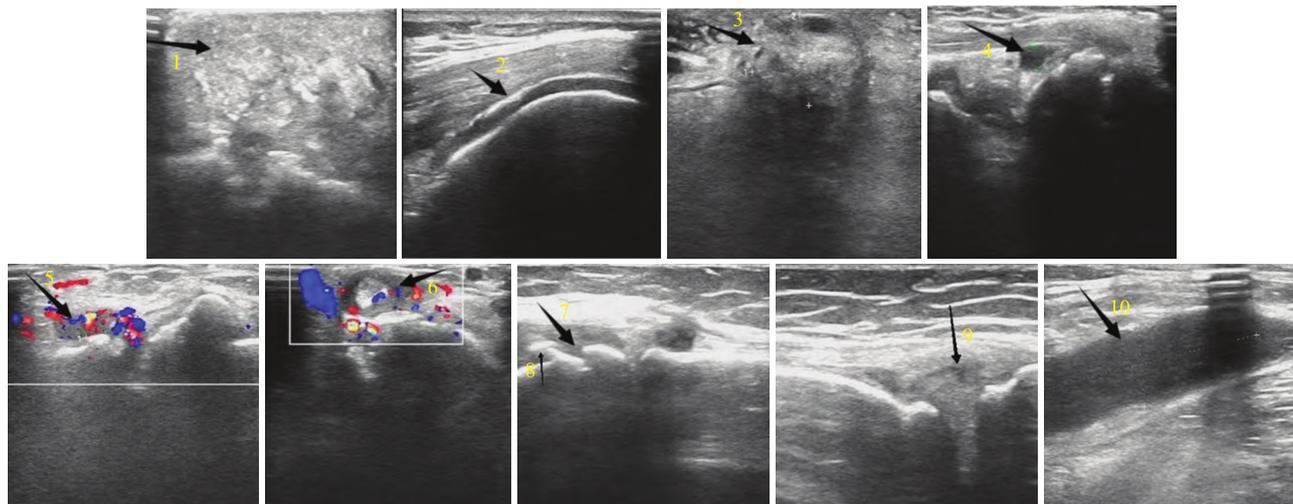


图1 有症状关节病变超声征象图

1:点状强回声;2:双轨征;3:痛风石;4:关节腔积液;5:腱鞘炎;6:滑膜炎;7:骨侵蚀;8:骨赘;9:半月板损伤;10:腘窝囊肿

表2 两组有症状关节病变分布情况[n(%)]

组别	n	手指关节	腕关节	膝关节	足趾关节	踝关节	肘关节	肩关节
RA	85	45(52.9)	32(37.6)	53(62.4)	3(3.5)	7(8.2)	3(3.5)	1(1.2)
GA	55	11(20.0)	6(11.0)	35(63.6)	10(18.2)	14(25.5)	2(3.6)	0(0)

表3 两组有症状关节病变超声征象[n(%)]

超声征象	RA组	GA组	χ^2 值	P值
点状强回声	1(1.2)	22(40.0)	36.659	<0.001
双轨征	0(0)	25(45.5)	47.036	<0.001
痛风石	0(0)	24(43.6)	44.765	<0.001
关节腔积液	70(82.4)	44(80.0)	0.122	0.727
腱鞘炎	24(28.2)	5(9.1)	7.452	0.006
滑膜炎	82(96.5)	37(67.3)	22.328	<0.001
骨侵蚀	48(56.5)	11(20.0)	18.216	<0.001
骨赘	13(15.3)	2(3.6)	4.744	0.029
半月板损伤	36(42.4)	10(18.2)	8.843	0.003
腘窝囊肿	19(22.4)	5(9.1)	4.135	0.042

表4 超声征象对RA的诊断效能

超声征象	灵敏度 (%)	特异度 (%)	AUC	P值	95% CI
腱鞘炎	28.2	90.9	0.596	0.056	0.502~0.690
滑膜炎	96.5	32.7	0.646	0.004	0.548~0.744
骨侵蚀	56.5	80.0	0.682	<0.001	0.593~0.772
骨赘	15.3	96.4	0.558	0.245	0.463~0.654
半月板损伤	42.4	81.8	0.621	0.016	0.528~0.714
腘窝囊肿	22.4	90.9	0.566	0.186	0.471~0.662
联合诊断 ^a	100.0	23.6	0.618	0.018	0.519~0.717

^a:滑膜炎、骨侵蚀、半月板损伤3项超声表现(以任一项诊断阳性即确诊为RA)联合诊断

症状关节病变超声征象中,痛风石与病程有一定相关性($r=0.392, P=0.003$)。见表6。

表5 超声征象对GA的诊断效能

超声征象	灵敏度 (%)	特异度 (%)	AUC	P值	95% CI
点状强回声	40.0	88.0	0.694	<0.001	0.599~0.790
双轨征	45.5	100.0	0.727	<0.001	0.634~0.820
痛风石	43.6	100.0	0.718	<0.001	0.624~0.812
联合诊断 ^a	81.8	88.0	0.903	<0.001	0.840~0.966

^a:点状强回声、双轨征、痛风石三项超声表现(以任一项诊断阳性即确诊为GA)联合诊断

表6 超声征象与病程的相关性

超声征象	RA的病程		GA的病程	
	r	P值	r	P值
点状强回声	-0.037	0.733	-0.051	0.711
双轨征	-	-	-0.177	0.197
痛风石	-	-	0.392	0.003
关节腔积液	-0.158	0.149	-0.115	0.403
腱鞘炎	-0.190	0.082	0.060	0.664
滑膜炎	0.100	0.364	-0.179	0.190
骨侵蚀	0.290	0.007	0.188	0.169
骨赘	0.175	0.109	0.033	0.811
半月板损伤	0.213	0.050	-0.038	0.785
腘窝囊肿	-0.023	0.835	0.105	0.447

2.5 超声征象与病程的相关性 通过相关性分析显示,RA组有症状关节病变超声征象中,骨侵蚀与病程有一定相关性($r=0.29, P=0.007$);GA组有

3 讨论

风湿性关节炎的良好管理需要一种能够进行早

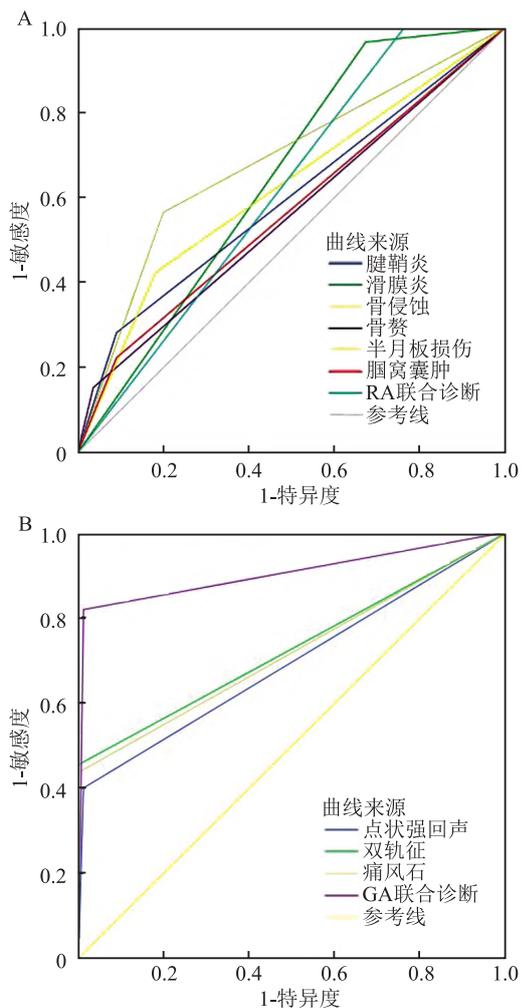


图2 超声征象诊断的 ROC 曲线图

A: 超声征象对 RA 的诊断; B: 超声征象对 GA 的诊断

期检测、治疗监测、预后预测的辅助检查。RA 的基本病理特征是滑膜炎,而 MSUS 可以检测滑膜增生和滑膜血管,提供了一种评估滑膜炎的灵敏方法^[6]。GA 与体内尿酸盐沉积相关,而 MSUS 被认为是监测尿酸盐沉积的最有效的影像学检查方式^[7]。因此,MSUS 检查对于改善风湿性关节炎患者病情及生活质量十分必要,RA 和 GA 又是风湿性关节炎中比较常见的两种疾病,该研究通过比较二者有症状关节特点及超声征象,旨在为临床诊断及鉴别诊断提供参考。

流行病学调查结果与该研究的结论相似,RA 在中年女性和老年患者中更为普遍^[8],主要呈多关节对称性受累^[9];GA 的患病人群呈年轻化趋势,男性发病率高于女性^[10],多以单关节剧烈肿痛迅速发作^[11]。而造成这种性别、年龄患病率的显著差异,可能与生活饮食习惯、性激素水平相关。这提示人们应该加强健康理念、合理饮食及良好生活作息。

超声医师对于 RA 患者可以通过进行双侧多关节对比扫查以提高疾病检出率,临床医师对于 GA 患者在体格检查时要仔细辨别有症状关节以提高超声检查结果的准确性。

RA 最初易累及手足小关节,而后扩散到较大的关节^[12];GA 最常累及的关节是第一跖趾关节,下肢多于上肢^[13]。然而,该研究表明 RA 与 GA 可累及至全身多个关节,其中膝关节病变检出率最高。分析原因可能有两点,一是该研究对象为住院患者,大多病情较重,只有极少数处于疾病早期阶段;二是膝关节是承担人体负重的主要关节、大关节,也更易受损伤、更易检出病变。这提示临床医师应该将膝关节超声检查纳入 RA 和 GA 住院患者的常规筛查中,以此提高关节病变检出率。

该研究对 RA 和 GA 的主要超声征象分别进行了 ROC 曲线分析,其结果与相关理论一致,RA 的主要病理特征是滑膜组织反复慢性炎症、软骨破坏、骨侵蚀^[14],GA 的特异性病变是尿酸盐晶体沉积,包括聚集体、双轨征及痛风石^[15]。这提示超声医师在进行检查时,应加大对主要超声征象的针对性扫查;联合点状强回声、双轨征、痛风石 3 项超声征象进行诊断可以提高对 GA 的诊断效能,同时具有较高的灵敏度、特异度;而对于 RA 患者不仅要加强对骨侵蚀的扫查以提高诊断效能,还要联合滑膜炎、半月板损伤超声征象的扫查以提高检查的灵敏度、特异度。

此外,通过相关性分析得出,RA 组骨侵蚀与病程呈正相关,GA 组痛风石与病程呈正相关。这与相关研究报道一致,Di Matteo et al^[16]研究认为骨侵蚀可以预测 RA 疾病的发展,Lu et al^[17]研究指出 GA 疾病持续时间与痛风石的存在呈独立正相关。分析原因,可能是因为病程较长的患者未进行规范化检查及治疗,导致病情迁延不愈、反复发作甚至发生严重并发症。因此,临床诊疗需要多关注病情进展、定期检查,重点加强预防骨侵蚀、痛风石,可以通过定期评估来预防,帮助患者改善临床结局、避免不可逆的关节损伤。

该研究得出一定结论,RA 与 GA 的超声征象具有一定差异,MSUS 在二者诊断及鉴别诊断上具有较好价值,但也存在着局限性,主要是研究对象、有症状关节数量有限,这需要今后进一步探究。

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A comparative evaluation of the role of musculoskeletal ultrasound in diagnosing symptomatic joint lesions in patients with rheumatoid arthritis and gouty arthritis

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Abstract Objective To compare the ultrasound signs of symptomatic joint lesions in rheumatoid arthritis (RA) and gouty arthritis (GA), musculoskeletal ultrasound (MSUS) was utilized. **Methods** A retrospective analysis was performed for 85 hospitalized patients with RA and 55 hospitalized patients with GA in the same period, and the differences in general data, diseased joints and ultrasound signs between the two groups were compared. **Results** The gender, age and diseased joints of the two groups were statistically significant (all $P < 0.05$). The detection rate of knee joint lesions was the highest; the RA group had high sensitivity, high specificity of meniscal injury, and high diagnostic efficiency of bone erosion, while the diagnostic performance of the three combined ultrasound signs of punctate strong echo, double track sign and tophi in the GA group was higher than that of any individual diagnosis, and the sensitivity and specificity were also higher. The course of disease in the RA group was positively correlated with bone erosion ($P < 0.05$), and the course in the GA group was positively correlated with tophi ($P < 0.05$). **Conclusion** The ultrasound signs of RA and GA are different, and MSUS has good value in the diagnosis and differential diagnosis of the two.

Key words musculoskeletal ultrasound; rheumatoid arthritis; gouty arthritis; joint pathology; diagnosis