RHEUMATOLOGY

Rheumatology 2017;56:1395–1400
doi:10.1093/rheumatology/kex076
Advance Access publication 31 May 2017

Concise report

Intercentre variance in patient reported outcomes is lower than objective rheumatoid arthritis activity measures: a cross-sectional study

Nasim Ahmed Khan[1,2], Horace Jack Spencer[3], Elena Nikiphorou[4], Antonio Naranjo[5], Rieki Alten[6], Rodica M. Chirieac[7], Alexandros A. Drosos[8], Pál Géher[9], Nevsun Inanc[10], Eduardo Kerzberg[11], Codrina Mihaela Ancuta[12], Rüediger Müller[13], Lykke Ørnbjerg[14] and Tuulliki Sokka[15]

Abstract

Objective. To assess intercentre variability in the ACR core set measures, DAS28 based on three variables (DAS28v3) and Routine Assessment of Patient Index Data 3 in a multinational study.

Methods. Seven thousand and twenty-three patients were recruited (84 centres; 30 countries) using a standard protocol in the Quantitative Standard Monitoring of Patients with RA study. Analysis of variance (ANOVA) and mixed-effect analysis of covariance models were used to model the relationship between study centre and different patient-reported and physician-reported RA activity measures. These models were built to adjust for the remaining ACR core set measure (for each ACR core set measure or each composite index), socio-demographics and medical characteristics. ANOVA and analysis of covariance models yielded similar results, and ANOVA tables were used to present variance attributable to recruiting centre.

Results. The proportion of variances attributable to recruiting centre was lower for patient reported outcomes (PROs: pain, HAQ, patient global) compared with objective measures (joint counts, ESR, physician global) in all models. In the full model, variance in PROs attributable to recruiting centre ranged from 1.53% for patient global to 3.71% for HAQ compared with objective measures that ranged from 5.92% for physician global to 9.25% for ESR; and was lower for Routine Assessment of Patient Index Data 3 (2.6%) compared with DAS28v3 (11.75%).

Conclusion. Intercentre variability in PROs is lower than objective measures of RA activity demonstrating that PROs may be more comparable across centres, and the need for standardization of objective measures.

Key words: rheumatoid arthritis, disease activity assessment, patient reported outcomes, intercentre variance

CLINICAL SCIENCE

[1]Division of Rheumatology, University of Arkansas for Medical Sciences, [2]Central Arkansas Veterans Healthcare System, [3]Department of Biostatistics, University of Arkansas for Medical Sciences, Little Rock, Arkansas, USA, [4]Department of Rheumatology, The Whittington Hospital NHS Trust, London, UK, [5]Department of Rheumatology, Hospital Universitario de Gran Canaria Dr Negrin, University of Las Palmas, Las Palmas, Spain, [6]Department of Internal Medicine, Rheumatology, Schlosspark-Klinik, Teaching Hospital Charite, Berlin, Germany, [7]Rheumatology, Sanocare Medical Center, Iasi, Romania, [8]Department of Internal Medicine, Medical School, University of Ioannina, Ioannina, Greece, [9]1st Department of Rheumatology, Hospitaller Brothers of St John of God, Budapest, Hungary, [10]Division of Rheumatology, School of Medicine, University of Marmara, Istanbul, Turkey, [11]Department of Rheumatology, University of Buenos Aires, Buenos Aires, Argentina, [12]Rheumatology 2 Department, "Grigore T. Popa" University of Medicine and Pharmacy, Iasi, Romania, [13]Division of Rheumatology, Immunology and Rehabilitation, Kantonsspital St Gallen, St Gallen, Switzerland, [14]Copenhagen Center for Arthritis Research, Center for Rheumatology and Spine Diseases, Rigshospitalet Glostrup, Denmark and [15]University of Eastern Finland, Faculty of Health Sciences, Kuopio and Jyvaskyla Central Hospital, Jyvaskyla, Finland

Submitted 26 September 2016; revised version accepted 22 February 2017

*Correspondence to: Nasim A. Khan, Division of Rheumatology, University of Arkansas for Medical Sciences, 4301 West Markham Street, Mail slot # 509, Little Rock, AR 72205, USA.
E-mail: nakhan@uams.edu

Rheumatology key messages

- Patient reported outcomes had lower intercentre variance than physician and laboratory assessed RA activity measures.
- Multicentre studies should attempt to standardize the physician and laboratory assessed measures of RA activity.

Introduction

There is currently no gold standard measure or test for RA activity assessment. Hence, RA activity assessment is derived from multiple measures including one or more of physician assessed measures, patient reported outcomes (PROs) and laboratory markers of inflammation [1, 2]. Ideally, the variability in RA activity assessment measures should only be influenced by RA inflammation. However, poor reliability has been reported both for physician assessed measures and PROs [3–5].

Clinical trials and epidemiological RA studies often recruit patients from multiple centres. No study has examined the relative differences in variance of different RA activity measures among patients assessed by different physicians or at different centres. Understanding such differences could help identify RA activity measures that are more comparable across centres, and measures that may need standardization. Our objective was to study the proportion of variance in scores of (i) the ACR core set measures [1], (ii) DAS28 (representative physician and laboratory measure derived composite index) [6], and (iii) Routine Assessment of Patient Index Data 3 (RAPID3, representative PRO-derived composite index) explained by intercentre (or between-centre) differences (as surrogate of different physician) in a multinational study [7].

Methods

Study population

The Quantitative Standard Monitoring of Patients with RA (QUEST-RA) study recruited RA patients receiving usual care from rheumatologists in three or more rheumatology clinics in several countries [8]. One hundred non-selected consecutive RA patients were recruited from each participating clinic and assessed using a standard protocol. A centre represented each study site for our analyses. Information was obtained about the seven ACR core set measures [tender joint count based on 28-joint assessment (TJC28), swollen joint count based on 28-joint assessment (SJC28), physician's global assessment of RA activity (MDGL), ESR, pain, patient's global assessment of RA activity (PTGL), physical function by the HAQ]. DAS28 based on three variables (DAS28v3) was used as it does not include any PRO and was calculated by the formula $[0.56 \times \sqrt{(\text{TJC28})} + 0.28 \times \sqrt{(\text{SJC28})} + 0.70 \times \ln(\text{ESR})] \times 1.08 + 0.16$ [6]. RAPID3 was calculated by the formula $\text{HAQ} \times 3.3 + \text{Pain} + \text{PTGL}$ [7]. The QUEST-RA study was carried out in compliance with the Declaration of Helsinki. Ethics committees or internal review boards of participating institutes approved the study. This analysis of de-identified data from the QUEST-RA study did not require approval.

Statistical analysis

Analysis of variance and mixed-effect analysis of covariance models were constructed to assess intercentre variance in the study measures. A base model included only the patient recruiting centre (clinic) as a variable. The ACR core model included variables shown in Table 1. In general, each ACR core set variable was modelled as a function of the remaining core set measures except the global score(s) as conceptually global scores represent overall impression by the patient or the physician about RA disease activity [9, 10]. DAS28v3 and RAPID3 models excluded ACR core set measures that are components of these indices. The demographic/medical model had demographic variables, RA characteristics and comorbidities that may influence patient experience or physician assessment of RA. Psychological distress was assessed by psychological HAQ and comorbidity burden by an index derived from 10 comorbidities [9, 10]. Finally, a full model including variables in both the ACR and demographic/medical models was constructed. A variable representing the patient recruiting centre was included in all models. Analysis of variance tables were used to decompose the total variance or sums of squares (SS_{total}) to those attributable to the predictors ($SS_{predict}$), the patient recruiting centre (SS_{centre}) and residual ($SS_{residual}$). We report the percentage of the total variance of each study measure that is explained by the predictors, the centre and residual (unexplained). An analysis of covariance approach that accounts for unequal variances and correlated data showed similar results. Multiple imputations of missing data were performed as detailed previously [9, 10].

Results

Seven thousand five hundred and sixty-eight patients from 84 centres located in 30 countries were assessed; 545 (7.2%) patients were excluded either because information on two or more ACR core set measures or five or more study variables were missing. Seven thousand and twenty-three patients (4004 with complete and 3019 with data imputed for $\geqslant 1$ variable) with a mean age (S.D.) of 55 (14) years and disease duration of 10.8 (9.5) years were included in the analysis; 79.8% were women and 72.1% were white. The mean (S.D.) DAS28v3 and RAPID 3 were 4.3 (1.7) and 11.4 (7), respectively. Supplementary Table S1, available at *Rheumatology* Online, provides the details of the demographics and clinical characteristics of the study patients.

Table 2 shows the SS_{total} (total variance) and percentage of variance explained by the predictors in the models, recruiting centre and residual for the ACR core set measures, RAPID3 and DAS28v3. Compared with the ACR core set model, the demographics/medical

TABLE 1 List of covariates included in the study models

Measure	Covariates in ACR model	Covariates (for all measures) in demographic/medical model
Pain	HAQ, TJC28, SJC28, ESR	Age, ethnicity (white, others), gender, education >12 years (yes, no), RA duration, RF status, fatigue score (0–10 cm VAS), morning stiffness duration (0, 1–60, >60 min), BMI, chronic back pain (yes, no), FM (yes, no), OA (yes, no), comorbidity burden (0–9), psychological HAQ (0–3)
HAQ	Pain, TJC28, SJC28, ESR	
TJC28	Pain, HAQ, SJC28, ESR	
SJC28	Pain, HAQ, TJC28, ESR	
ESR	Pain, HAQ, TJC28, SJC28	
PTGL	Pain, HAQ, TJC28, SJC28, ESR	
MDGL	Pain, HAQ, TJC28, SJC28, ESR	
RAPID3	TJC28, SJC28, ESR	
DAS28v3	Pain, HAQ, PTGL	

DAS28v3: DAS 28 based on 3 variables; MDGL: physician's global assessment of disease activity; PTGL: patient's global assessment of RA activity; RAPID3: Routine Assessment of Patient Index Data 3; SJC28: swollen joint count on 28 joints assessment; TJC28: tender joint count on 28 joints assessment; VAS: visual analogue scale.

model explained variance in pain (43.75% *vs* 43.71%) and HAQ scores (40.62% *vs* 45.25%) similarly, but much less for the TJC28 (20.10% *vs* 42.93%), SJC28 (10.73% *vs* 35.70%) and ESR (8.41% *vs* 13.93%). Variance in both the global scores (PTGL and MDGL) was better explained by the ACR core set model than the demographic/medical model. RAPID3 variance was much better explained by the medical/demographic model compared with DAS28v3. A large proportion of variance (ranging from 35.74% for MDGL to 75.95% for ESR in the full model) in our study measures remained unexplained despite the inclusion of several socio-demographic, RA and other medical characteristic related variables in the models.

As expected, the variance explained by between centre differences for each study measure was most for the base model that had centre as the only variable and least for the full model. In each of the four models, the variances in PROs were less likely to be explained by between centre differences (ranging from 1.53% for PTGL to 3.71% for HAQ in the full model) compared with physician assessed measures and ESR (ranging from 5.92% for MDGL to 9.25% for TJC28 in the full model). Similarly, much larger proportion of variance in DAS28v3 (11.75% in the full model) was explained by the recruiting centre compared with RAPID3 (2.60% in the full model). The proportion of the total known variance (as measured by the sum of the $SS_{predict}$ and SS_{clinic}) accounted for by differences due to centres was considerably lower for patient reported measures [pain (3.8%), PTGL (2.5%), HAQ (6.43%) for the full model] compared with physician derived and laboratory measures [SJC28 (17.50%), TJC28 (16.87%) and ESR (32.7%) for the full model]. Similar relative differences in the intercentre variance were found for RAPID3 (4.17%) and DAS28v3 (23.4%) as were noted in the full model.

Discussion

We examined intercentre variability in the ACR core set measures, RAPID3 and DAS28v3 in the QUEST-RA study through analysis of data from 84 centres across 30 countries. The wide geographical area covered is a unique feature of this study. Inherent differences in social, economic and healthcare systems unavoidably translate into large differences in RA activity measures [8]. Consequently, multiple models were constructed to adjust for the differences in RA activity measures, socio-demographics, RA characteristics and comorbidities to study intercentre variability. Our results show that relative intercentre differences were lower for PROs than physician assessed measures and ESR. This translated into much larger intercentre variance in DAS28v3 compared with RAPID3.

Our study is relevant for the planning and conduct of multicentre RA clinical trials and epidemiological studies. Multicentre studies and consortia have the advantage of allowing for rapid recruitment of patients from a wide range of settings. An unavoidable consequence of multicentre data collection is data clustering: individuals within centres are more similar than those from different centres [11, 12]. Data clustering may result from non-random differences in measurements taken by different physicians recruiting in different centres, differences in laboratory equipment and test conducting, and differences in the patient population such as socio-cultural characteristics [11, 12].

Intraclass or intracluster correlation (ICC), defined as the proportion of total variance in an outcome attributed to differences between centres or clusters, has been used to assess intercentre variance [12, 13]. The intercentre variance in our study outcome measures seems relatively small, ranging from 1.53 to 11.75% in the full model. For a comparative perspective, median (interquartile range) ICC for 1039 outcomes from 31 primary care studies was 0.01 (0–0.032) corresponding to median 1% (0–3.2%) intercentre variance [14]. Among 48 ICCs in 10 multicentre surgery trials, 15% were between 0.05 and 0.10 and 29% were >0.10 [13].

Failure to account for centre effects, particularly with ⩾5% intercentre measure variance, in multicentre trials can inflate variance, bias estimates of treatment effect

TABLE 2 Total and the distribution of variance of the study outcome measures

Measure	Total SS	Base model (% total SS)[a]		ACR core set model (% total SS)[a]			Demographic/medical model (% total SS)[a]			Full model (% total SS)[a]		
		SS_{centre}	$SS_{residual}$	$SS_{predict}$	SS_{centre}	$SS_{residual}$	$SS_{predict}$	SS_{centre}	$SS_{residual}$	$SS_{predict}$	SS_{centre}	$SS_{residual}$
ACR core set measures												
Pain	51 260.91	12.28	87.82	43.71	3.30	53.00	43.75	3.76	52.48	54.15	2.14	43.71
HAQ	4137.69	14.13	85.87	45.25	4.36	50.39	40.62	6.87	52.52	53.90	3.71	42.39
PTGL	51 275.43	12.19	87.81	57.50	1.56	40.94	38.59	4.72	56.70	59.64	1.53	38.83
TJC28	39 9384.49	28.42	71.58	42.93	11.17	45.89	20.10	17.86	62.04	45.59	9.25	45.15
SJC28	201 526.78	19.16	80.84	35.70	7.86	56.44	10.73	14.29	74.98	36.56	7.75	55.68
ESR	415 2798.51	13.87	86.13	13.93	9.18	76.89	8.41	10.51	81.07	16.19	7.87	75.95
MDGL	39 419.41	26.59	73.41	57.40	6.12	36.48	24.58	15.69	59.72	58.34	5.92	35.74
Composite indices												
RAPID3	339 118.80	15.05	84.95	30.72	5.03	64.26	52.10	5.09	42.81	59.74	2.60	37.66
DAS28	18 101.01	29.35	70.65	34.14	14.63	51.22	24.36	17.85	57.79	38.46	11.75	49.79

[a]See 'Methods' section and Table 1 for predictors in the four models. DAS28: DAS based on 28 joint evaluation; MDGL: physician's global assessment of disease activity; PTGL: patient global assessment of RA activity; RAPID3: Routine Assessment of Patient Index Data 3; SJC28: swollen joint count on 28 joint evaluation; SS: sums of squares; SS_{centre}: percentage of total SS attributable to recruiting centre; $SS_{predict}$: percentage of total SS attributable to the predictors in the model; $SS_{residual}$: percentage of total SS that remained unexplained by the model; TJC28; tender joint count on 28 joint evaluation.

and reduce the power of a study by lowering the effective sample size [11, 12]. This was exemplified by an RA clinical trial of epitope-specific immunotherapy that enrolled 160 patients from 11 centres in the USA and Mexico that did not meet an *a priori* primary end point. However, after adjusting for sizable differences in clinical effect between centres, a significant clinical effect was found [15]. Inclusion of cluster effect, particularly when relatively strong (ICC $\geqslant$ 5%), also results in better performance of prediction models derived from multicentre data [16]. Statistical approaches that allow for assessment of clustering effect have been proposed as a quality control measure for the centre clustering effect during the conduct of multicentre studies [17].

The clustering effect was stronger for objective outcomes (TJC, SJC, MDGL and ESR) compared with PROs (pain, HAQ and PTGL). The relatively small intercentre variance in PROs is surprising given patient recruitment from very diverse socio-economic, cultural and educational backgrounds. This suggests that disease experience of RA is quite similar across a wide range of patient populations. Swollen and tender joints count assessment by physicians is the most conventional way of detecting clinical synovitis, and is predictive of radiographic progression [18]. These objective measures make a disproportionately larger contribution to assess RA disease activity and treatment response in clinical trials and most observational studies. Our data highlight the importance of measures to standardize joint count methodology and laboratory assays. Standardized joint examination training has been shown to significantly reduce interassessor variability [19]. However, a recent systematic review found inconclusive evidence for training to improve SJC reliability, and further evaluation of patient-reported joint counts as an outcome measure was proposed [5]. Our results also underscore the importance of developing new RA activity assessment biomarkers that are more amenable to standardization.

Our study has certain limitations. Our results may potentially be misinterpreted as showing the superiority of PROs compared with more objective outcomes for RA activity assessment. We only assessed an aspect (intercentre variance) of these measures. In this narrow sense, PROs appear to be more comparable across multiple centres compared with the joint counts and ESR. Specific information about provider assessing patients in each centre was lacking, and intercentre variability may not strictly be identical to interphysician variability. No formal attempt was made to train study investigators for standardising joint examination, although the majority of investigators had participated in RA clinical research studies. A large proportion of variance in study variables remained unexplained despite the inclusion of most conventional RA disease activity measures, socio-demographics, and comorbidities (relatively more for objective measures than PROs). This likely reflects widely dispersed recruiting centres that would invariably introduce unmeasured patient and physician related social, cultural and economic influences. Compared with a two-centre RA study from Vienna, Austria where ACR

core set measures explained 77.4 and 66.7% variance, respectively, in PTGL and MDGL scores [20], our study explained 58.54 and 58.44% variance. Nonetheless, this does not preclude assessment of relative differences in intercentre variability in RA activity measures. Our results also show that larger intercentre variance is not simply related to the unexplained variance in the study measure (e.g. ESR has the higher unexplained variance but comparatively lower intercentre variance). Finally, QUEST-RA is a cross-sectional study, and centre effect assessment in longitudinal observational studies and clinical trials is needed to better understand its implications.

In conclusion, this study demonstrates that intercentre variance of PROs is lower than for joint counts, ESR and MDGL. Multicentre studies should consider the impact of centre effect and where possible take action to reduce it, for example, through data quality assessment and making appropriate statistical adjustments when analysing data.

Acknowledgements

The authors are grateful to all investigators in the QUEST-RA study. Funding sources did not participate in study design and the collection, management, analysis and interpretation of data, and preparation, review or approval of the manuscript and the decision to submit it for publication. T.S. was supported by grants from Central Finland Health Care District erityisvaltionosuus (EVO) grant, the Finnish Academy and Abbott, and N.A.K. and H.S. were supported by the National Centre For Research Resources [Award Number 1UL1RR029884].

Funding: No specific funding was received from any bodies in the public, commercial or not-for-profit sectors to carry out the work described in this manuscript.

Disclosure statement: T.S. has received a research grant from Abbott. All other authors have declared no conflicts of interest.

Supplementary data

Supplementary data are available at *Rheumatology* Online.

References

1 Felson DT, Anderson JJ, Boers M *et al*. The American College of Rheumatology preliminary core set of disease activity measures for rheumatoid arthritis clinical trials. Arthritis Rheum 1993;36:729–40.

2 Anderson J, Caplan L, Yazdany J *et al*. Rheumatoid arthritis disease activity measures: American College of Rheumatology recommendations for use in clinical practice. Arthritis Care Res 2012;64:640–7.

3 Lassere MN, van der Heijde D, Johnson KR, Boers M, Edmonds J. Reliability of measures of disease activity and disease damage in rheumatoid arthritis: implications for smallest detectable difference, minimal clinically important difference, and analysis of treatment effects in randomized controlled trials. J Rheumatol 2001;28:892–903.

4 Salaffi F, Filippucci E, Carotti M *et al*. Inter-observer agreement of standard joint counts in early rheumatoid arthritis: a comparison with grey scale ultrasonography—a preliminary study. Rheumatology 2008;47:54–8.

5 Cheung PP, Gossec L, Mak A, March L. Reliability of joint count assessment in rheumatoid arthritis: a systematic literature review. Semin Arthritis Rheum 2014;43:721–9.

6 Prevoo ML, van 't Hof MA, Kuper HH *et al*. Modified disease activity scores that include twenty-eight-joint counts. Development and validation in a prospective longitudinal study of patients with rheumatoid arthritis. Arthritis Rheum 1995;38:44–8.

7 Pincus T, Yazici Y, Bergman M. A practical guide to scoring a Multi-Dimensional Health Assessment Questionnaire (MDHAQ) and Routine Assessment of Patient Index Data (RAPID) scores in 10-20 seconds for use in standard clinical care, without rulers, calculators, websites or computers. Best Pract Res Clin Rheumatol 2007;21:755–87.

8 Sokka T, Kautiainen H, Pincus T *et al*. Disparities in rheumatoid arthritis disease activity according to gross domestic product in 25 countries in the QUEST-RA database. Ann Rheum Dis 2009;68:1666–72.

9 Khan NA, Spencer HJ, Abda E *et al*. Determinants of discordance in patients' and physicians' rating of rheumatoid arthritis disease activity. Arthritis Care Res 2012;64:206–14.

10 Khan NA, Spencer HJ, Abda EA *et al*. Patient's global assessment of disease activity and patient's assessment of general health for rheumatoid arthritis activity assessment: are they equivalent? Ann Rheum Dis 2012;71:1942–9.

11 Localio AR, Berlin JA, Ten Have TR, Kimmel SE. Adjustments for center in multicenter studies: an overview. Ann Intern Med 2001;135:112–23.

12 Kahan BC, Morris TP. Analysis of multicentre trials with continuous outcomes: when and how should we account for centre effects? Stat Med 2013;32:1136–49.

13 Cook JA, Bruckner T, MacLennan GS, Seiler CM. Clustering in surgical trials – database of intracluster correlations. Trials 2012;13:2.

14 Adams G, Gulliford MC, Ukoumunne OC *et al*. Patterns of intra-cluster correlation from primary care research to inform study design and analysis. J Clin Epidemiol 2004;57:785–94.

15 Koffeman EC, Genovese M, Amox D *et al*. Epitope-specific immunotherapy of rheumatoid arthritis: clinical responsiveness occurs with immune deviation and relies on the expression of a cluster of molecules associated with T cell tolerance in a double-blind, placebo-controlled, pilot phase II trial. Arthritis Rheum 2009;60:3207–16.

16 Bouwmeester W, Twisk JW, Kappen TH *et al*. Prediction models for clustered data: comparison of a random intercept and standard regression model. BMC Med Res Methodol 2013;13:19.

17 Guthrie LB, Oken E, Sterne JA *et al*. Ongoing monitoring of data clustering in multicenter studies. BMC Med Res Methodol 2012;12:29.

18 Aletaha D, Alasti F, Smolen JS. Rheumatoid arthritis near remission: clinical rather than laboratory inflammation is associated with radiographic progression. Ann Rheum Dis 2011;70:1975–80.

19 Grunke M, Antoni CE, Kavanaugh A *et al*. Standardization of joint examination technique leads to a significant decrease in variability among different examiners. J Rheumatol 2010;37:860–4.

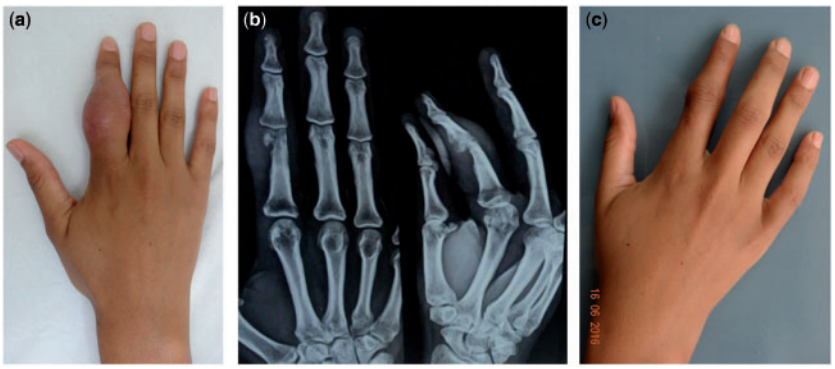
20 Studenic P, Radner H, Smolen JS, Aletaha D. Discrepancies between patients and physicians in their perceptions of rheumatoid arthritis disease activity. Arthritis Rheum 2012;64:2814–23.

Clinical vignette

Rheumatology 2017;56:1400
doi:10.1093/rheumatology/kex052
Advance Access publication 17 March 2017

Spina ventosa—a rare cause of sausage digit

Fig. 1 Tubercular dactylitis resulting in fusiform swelling of right index finger, and significant improvement after 2 months of anti-tubercular treatment



(**A**) Visibly enlarged right index finger with a firm, fusiform swelling involving the proximal and middle phalanges, with overlying erythema. (**B**) X-Ray of the right hand (anteroposterior and oblique view) showing cortical erosion in distal part of proximal phalanx of index finger, sclerosis, minimal periosteal reaction and soft tissue swelling. (**C**) Significant improvement in the swelling at follow-up of 2 months.

A 21-year-old female presented to us with a 2-month history of painful swelling involving her right index finger with low-grade fever. Examination demonstrated a visibly enlarged index finger with a firm, fusiform swelling that involved the proximal and middle phalanges, with overlying erythema (Fig. 1A). Movements were painful. History of local trauma, cough, bowel or menstrual disturbance and immunosuppression could not be elicited. Serum HIV and VDRL were negative. Serum uric acid concentration and X-rays of chest and spine were normal. X-Ray of the digit showed cortical erosion in the distal part of proximal phalanx, minimal periosteal reaction and soft tissue swelling (Fig. 1B). Biopsy revealed granulomatous inflammation in the dermis and subcutaneous fat, with necrosis and Langhan's giant cells. Staining and culture for bacteria, fungi and mycobacteria were negative. Mantoux test was strongly positive (34 mm). A diagnosis of tubercular dactylitis/spina ventosa was made. The patient was started on anti-tubercular treatment and had significant improvement in the swelling at a follow-up of 2 months (Fig. 1C).

Dactylitis or sausage digit is an inflammatory fusiform digital swelling. Differentials include infections (pyogenic osteomyelitis, tuberculosis, phaeohyphomycosis), PsA, sarcoidosis, reactive arthritis, gout and bone tumours. Spina ventosa is tubercular osteomyelitis of the phalanges that can spread to overlying soft tissues causing sausage digit. Although rare, it is important to consider tuberculosis as cause of sausage digit in an endemic area because of the excellent response to anti-tubercular treatment [1, 2].

Funding: No specific funding was received from any bodies in the public, commercial or not-for-profit sectors to carry out the work described in this manuscript.

Disclosure statement: The authors have declared no conflicts of interest.

Anuradha Bishnoi[1] and Sendhil M. Kumaran[1]

[1]*Department of Dermatology, Venereology and Leprology, Post Graduate Institute of Medical Education and Research, Chandigarh, India*

Correspondence to: Sendhil M. Kumaran, Department of Dermatology, Venereology and Leprology, Post Graduate Institute of Medical Education and Research, Sector 12, Chandigarh, India.
E-mail: drsen_2000@yahoo.com

References

1 Ritz N, Connell TG, Tebruegge M, Johnstone BR, Curtis N. Tuberculous dactylitis—an easily missed diagnosis. Eur J Clin Microbiol Infect Dis 2011;30:1303–10.

2 Sbai MA, Benzarti S, Sahli H, Sbei F, Maalla R. Osteoarticular tuberculosis dactylitis: four cases. Int J Mycobacteriol 2015;4:250–4.