Two types of bony changes are recorded radiographically in rheumatoid arthritis: erosions and juxta-articular osteopenia. Current methods of assessment use changes in the numbers of the first, and tend to neglect the second which precede the development of erosions(1). Methods of quantifying trabecular organization using fractal signature analysis [FSA][2] measure the degree of ‘roughness’ of an image of trabecular bone and also quantifies the change in ‘roughness’ with alterations in spatial scale, i.e. the fractal signature relates to the amount of structure [trabecular number and size(3)] in an image. Through a series of meshes, to determine how much structure is present at a given scale. The measurements can be performed directionally so as to assess separately longitudinal and transverse trabeculae. The method is robust to changes in image contrast. The wrists of patients with early RA, treated with cyclosporine [Neoral, Novartis Pharmaceuticals], had microfocal radiographs [MFR] to assess whether changes in the juxta-articular bone organisation could be detected at the distal radius.

**Patients & Methods** In a single center, open prospective study 11 patients [women 7: men 4] mean [SE] age 54.3 [4.5] yrs, were recruited with RA, meeting revised ACR criteria (5) and disease duration < 2 yrs. All patients commenced treatment of Neoral [2.5mg/kg/day] in two divided doses following 4-week washout of existing DMARD. 6 patients discontinued treatment within a median of 3 months, 5 patients continued treatment for one year. Consequently, patients who remained on the study drug were classified as the treated group; patients who discontinued the drug were classified as the non-treated group. This method biased any test against finding a difference between the two groups. X5 MFRs(4) were taken of the non-dominant wrist at baseline and 1 year later. Images were digitised using a Lumysis 200 laser scanner. A region of interest [200 x 100 pixels] was selected at the same site in the distal radius of all patients. The FSA value at each scale was calculated between the two groups. X5 MFRs(4) were taken of the non-dominant wrist at baseline and 1 year later. Images were digitised using a Lumysis 200 laser scanner. A region of interest [200 x 100 pixels] was selected at the same site in the distal radius of all patients. The FSA value at each scale was calculated between the two groups. The difference was considered as the change in FSA value, and compared between the treated and non-treated groups using Analysis of Variance. Where a significant change was found, the time course data was plotted to see if any secular trends could be identified.

**Results** Within 12 months, the change in FSA values for medium sized transverse trabecular structures [~480µm] for the treated was significantly different (p=0.025 ANOVA) from that in the non-treated group [Fig.1]. Compared to the non-treated group, the FSA value for trabecular structures at this scale in the treated group changed in opposite directions with time [Fig.2]. No significant changes were detected in the longitudinal trabeculae in either group. In appearance, radiographs of the cancellous bone in patients continuing treatment showed increased disorganization, compared to those continuing treatment. There were no significant differences in patient age between the 2 groups that could give rise to these observations.

**Discussion** In this preliminary study, changes in trabecular bone architecture can be detected within 6 months to 1 year [Fig.2] in microfocal radiographs of RA patients treated with cyclosporine. High spatial and contrast resolution achieved with MFR permit trabecular detail to be imaged. FSA allows direct measurement of trabecular organization, permitting longitudinal and transverse trabeculae to be assessed separately. The increase in FSA in transverse trabeculae of the non-treated group corresponds to trabecular thinning and increased disorganization [Fig.2]. Conversely, the decrease in FSA in the treated group corresponds to an increase in transverse trabecular thickness. Similar changes in FSA have been described for trabecular thinning in osteoporosis(5) and thickening in osteoarthritis(6). Alterations in trabecular structure in these disease(5,6) occurred at similar size [~400µm] to the changes observed in this study. This suggests that a similar pathway is involved in changes to these trabeculae. The trabecular thickening in the treated group suggests that the decrease in inflammation, due to the cyclosporine, may permit restoration of bone architecture. The small numbers of patients and the open nature of the study preclude any statement on the