

# COMPENSATED POLARISED MICROSCOPY : A SIMPLE AND CHEAP MODIFICATION

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Crystal arthritis is a common cause of acute mono or oligoarthritis and an occasional cause of acute polyarthritis. Several crystals have been shown to cause arthritis, the commonest being monosodium urate and calcium pyrophosphate. Both these crystals show the property of birefringence and can be identified microscopically in the synovial fluid under compensated polarised light.

The mean level of serum uric acid in Polynesians<sup>1</sup> and Malaysian Chinese and Malays<sup>2</sup> is higher than those in Caucasian populations. As such a comparatively higher incidence of gouty arthritis may be expected in these groups. Conversely hyperuricaemia may be found as a co-incident finding in a patient presenting with arthritis due to another cause. A definitive diagnosis of crystal-induced arthritis by demonstration of their presence in synovial fluid, where possible, is therefore very desirable.

Identification of monosodium urate crystals in the synovial fluid of an acutely inflamed joint is a specific and sensitive method of diagnosis.<sup>3</sup> However, equipment to demonstrate their presence by compensated polarised microscopy is expensive and not readily available in most general and district hospitals.

We describe a simple and inexpensive method whereby an ordinary light microscope can be adapted for the above purpose. This was first described by Terrenc J. Fagan and M.D, Lidsky.<sup>4</sup> For the last one year, we have used this technique in the University Hospital, Kuala Lumpur with reliable and consistent results.

## METHOD

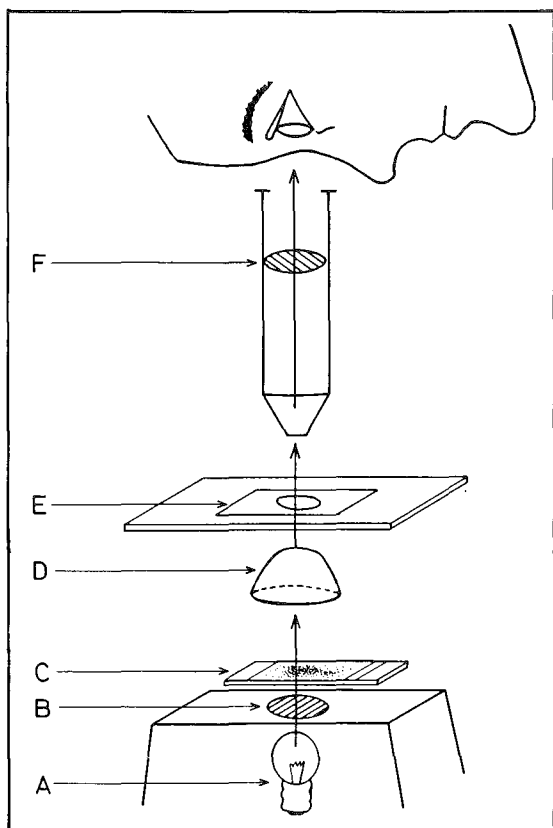
Synovial fluid is aspirated from the inflamed joint, a drop is placed on a clean slide and a cover slip applied (Fig. 1). An ordinary light microscope is adapted for compensated polarised microscopy by inserting one polarising lens (the polariser) (B) between the light source and the specimen and another between the specimen and the observer's eye (F) (the analyser). Polarising lenses from sunglasses can be effectively used by cutting them to the required size. Lens "B" is rotated until its axis is perpendicular to that of lens "F" and a dark field is obtained. A first order red compensator "C" is then introduced between the light source and the microscope stage by placing it directly over polarising lens "B". The compensator is made from two thicknesses of cellophane adhesive tape layered onto one side of a microscope glass slide.<sup>4</sup> The optical axis of the compensator is parallel to the streak lines in the cellophane. It is placed at 45 degrees to the axis of the polarisers to produce a red field. The specimen is then examined. If the optical axis of the monosodium urate crystal is parallel to the axis of the red compensator it will appear yellow and if it is perpendicular to it, it will appear blue (Figures 2A and B). This is due to the property of negative birefringence. Calcium pyrophosphate crystals which are positively birefringent display opposite colour

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**Figure 1 Polarised Microscopy**

The figure shows:

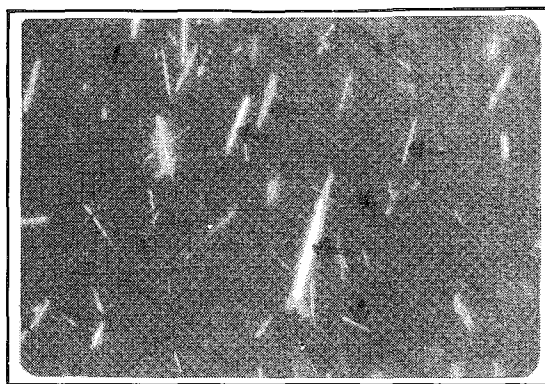
- A) Light source.
- B) The first polarising disk (polariser) with hatched lines showing the axis of transmission.
- C) Cellophane coated glass slide (the red compensator).
- D) Condenser.
- E) The slide to be examined.
- F) The second polarising disk (the analyser) with the axis of transmission perpendicular to that of the polariser A.

changes and can therefore be differentiated from monosodium urate crystals.

We hope that this simple and inexpensive method will assist in the definitive diagnosis of crystal arthritis in hospitals where expensive compensated polarised microscopy is not available.

### ACKNOWLEDGEMENT

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**Fig. 2A** Showing urate crystals examined under red compensated polarised light. Crystals with their longest axes parallel to that of the cellophane coated glass slide appear yellow (←) whereas crystals with perpendicular axes are blue (↓).



**Fig. 2B** The same field re-examined after the axis of the cellophane coated glass slide was turned 90. A reverse colour pattern of the crystals are observed.

### REFERENCES

- <sup>1</sup> Prior IAM, Rose BS, Harvey HPB, Davidson F. Hyperuricaemia, gout and diabetic abnormality in Polynesian people. *Lancet*, 1966, I : 333-338.
- <sup>2</sup> Duff IF, Mikkelsen WM, Dodge MJ, et al. Comparison of uric acid levels in some oriental and caucasian groups unselected as to gout or hyperuricaemia. *Arthritis & Rheumatism*, 1968, 11 : 184-190.
- <sup>3</sup> Wallace SL, Robinson H, Fouse A, Masi T, Decker JL, McCarthy DJ, Yu TF. Preliminary criteria for the classification of the acute arthritis of primary gout. *Arthritis & Rheumatism*, 1977, Vol. No. 3:89-900.
- <sup>4</sup> Fagan TJ, Lidsky MD. Compensated polarised light microscopy using cellophane adhesive tape. *Arthritis & Rheumatism*, 1974, Vol. 17, No. 3 : 256-262.