Ungual Tufts in the Follow-up of Patients on Maintenance Hemodialysis

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Abstract. A recent publication showed the earliest signs of renal osteodystrophy in patients on maintenance hemodialysis (MHD) to occur in the tufts [1]. We present three patients on MHD, in two of whom the earliest unequivocal radiographic improvement was seen in the tufts. The third patient had been on MHD and, following subtotal parathyroidectomy, showed significant osseous improvement in the hands with relatively equal improvement in the tufts and middle phalanges. It appears that, with the use of routine primary or secondary magnification, the tufts are radiographically a highly sensitive site for both the early occurrence and improvement of osteodystrophy in patients on MHD. We are not aware of any previous publication pointing out exclusive improvement in the tufts in patients on MHD with virtually no change in the mid-phalanges. Two of these three cases illustrate that renal osteodystrophy is reversible by maintenance hemodialysis alone.

Key words: Tufts – Occurrence – Improvement – Maintenance hemodialysis.

Methods and Results

A micro-focus tube of 90 has been used at this center for over three years for obtaining macro-radiographs of the hands of all patients on MHD. The hands are magnified approximately three times (X3). Medium speed film with fast screens and automatic processing has been used at all times. In a retrospective review of skeletal surveys of 40 patients on MHD we were impressed with unequivocal tuft improvement in three patients. In two of these patients, tuft improvement occurred in the absence of any notable change in the mid-phalanges (Figs. 1 and 2).

These two patients who were on MHD alone (three years) also showed decrease of serum phosphorus values. Parathormone levels for this period were not available. The third patient improved following a subtotal parathyroidectomy.

Discussion

Doyle [2] has pointed out that subperiosteal, subchondral, and subtendinous resorption of bone as a manifestation of renal osteodystrophy occurs at many sites in the skeleton, particularly the sacroiliac joints, lateral ends of the clavicles, proximal humeri, and lesser trochanter of the femora. However, these usually are not of diagnostic importance in the follow-up of patients on MHD because phalangeal changes are already present.

In a recent objective study, we showed that the earliest manifestations of renal osteodystrophy in the hands occurred in the tufts. Eastwood et al. [3] and Parfitt [4] have previously been impressed with the tufts manifesting the earliest signs of renal osteodystrophy. Hosking [5] in a single statement has expressed a similar view but made no attempt in substantiating it. We are unaware of any previous publication pointing out exclusive improvement in the tufts with relatively no change in the mid-phalanges (Figs. 1 and 2) of patients on MHD. Figure 3 illustrates equal improvement in the tufts and phalanges following subtotal parathyroidectomy.

The mid-phalanges have traditionally been subject to the closest scrutiny for signs of improvement in azotemic osteodystrophy. Unless some form of magnification, either primary or secondary, is routinely used the required detail for assessing the terminal phalanges is lacking. Further, unless the technique is consistently reproducible and the image permanently recorded the considerable merit of comparing like with like will be invalidated. Direct magnification radiography lends itself to consistency and reproducibility, with the macro-radiograph serving as a permanent record to phalangeal changes at a given time.
Fig. 1A and B. A (×2) Azotemic osteodystrophy manifest in the terminal tufts with less of the outer cortical line and significant resorption of subcortical bone in the index and middle distal phalanges. Possible minor subperiosteal resorption distally in the mid-phalanx of the third digit. B (×2, 15 months later) Significant improvement in the reconstitution of the tufts. The outer cortical line, however, remains absent. No change in the mid-phalanges. The increased sclerosis seen in some of the tufts probably represents increased mineral.

Figures 1 and 2 show radiographic improvement in patients whose serum phosphorus levels had come down from above 9 mg% to below 6 mg%. Unfortunately, no plasma parathormone levels were available for this period and no iliac crest biopsies were carried out. Ritz et al. [6] clearly state that the histologic equivalent of resorption defects at the outer cortical bone of the tufts do not necessarily represent loss of bone tissue but substitution of poorly mineralized fibrous bone for mature lamellar bone. This, they feel, accounts for the original shape of the bone being restored after appropriate therapy. We are uncertain about the relationship of lowered serum phosphorus levels and radiologic improvement in the tufts and in particular, whether there is any cause-effect relationship in our two patients. It is, however, noteworthy that the serum phosphorus level in the dialyzed patient, as in the uremic, is considered the major determinant of the severity of the secondary hyperparathyroidism [7, 8]. David [9] points out that Fournier et al. and Parfitt et al. dialyzed patients against a similar dialysate calcium and found that improvement in renal osteodystrophy occurred in the group with serum phosphorus below 6 mg% and worsened in that group above 6 mg%.

In two of these patients, during the period between the detection of abnormal tuft changes and improvement, no other characteristic features of azotemic osteodystrophy were discerned in the skull, clavicles, vertebrae, or pelvis. The third patient (Fig. 3) had widespread radiographic changes of azotemic osteo-