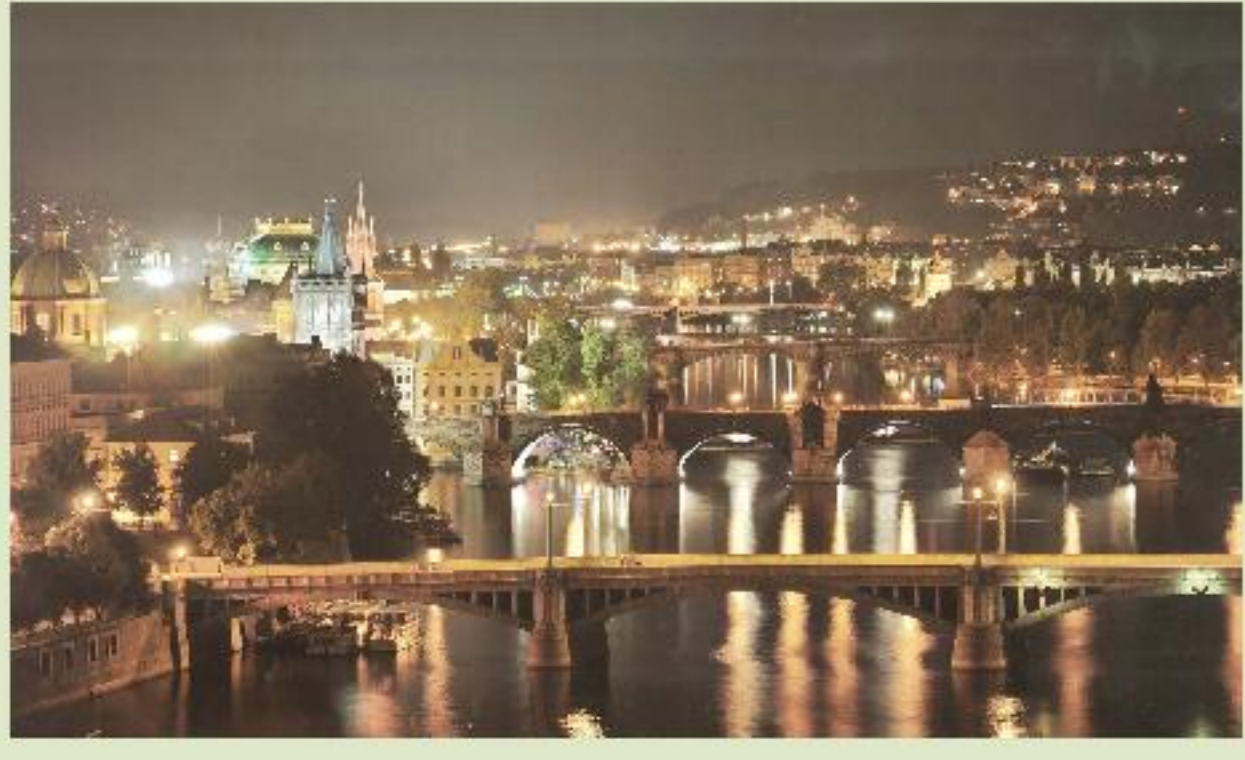# Osteoporosis and osteopenia in patients after kidney and pancreas transplantation

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Background:

Organ transplantation (Tx) is the standard treatment for end-stage renal failure in diabetic patients. With an improvement in patient and graft survival, the bone loss and persistent abnormalities in bone metabolism are long-term complications to manage. Pre-transplantation bone loss plays still an important role in BMD maintenance. The main post-transplantation risk factors associated with further bone loss/fractures are mainly large doses of glucocorticoids in an early post-transplantation period, choice of immunosuppressive regimens, in later period the impaired graft function and persistent hyperparathyroidism.

Patients and methods:

We investigated the prevalence of osteoporosis and osteopenia in 256 diabetic patients (M 142, F 114) after the kidney and pancreas Tx for renal failure due to diabetic nephropathy. The bone loss was diagnosed with densitometry (DEXA) using Lunar Prodigy apparatus in years 2010-2014. The characteristics of bone metabolism were regularly examined. We have measured on the plain CXR the clavicle bone index (BI), which is the ratio of cortical bone width (W) to total bone width (TBW) at the midpoint of the shaft. The cortical bone width (W) is calculated from TBW minus M (bone marrow width) (Fig. 2,3).

Results:

Osteoporosis of lumbar spine (L spine) and/or hips was diagnosed in 53/256 patients (20%), osteopenia in 135/256 (52%) and 68/256 (28%) of patients had normal bone density (Fig. 1). Osteoporosis was more prevalent in female patients (25%) than in male patients (18%) and osteopenia was present slightly more in males (54%) than females (50%). Patients with osteoporosis had affected mainly proximal femurs (hips) in 50/53 (94%) cases and distal forearm in 32/53 (60%). Osteoporosis of L spine was proven in 11/53 patients (21%) and osteopenia in 28/53 (53%) cases. BMD of L spine has tendency to improve over the follow-up period 1-4 years (mean 2.6y). The ratio of BMD L2 (the last BMD measurement) to L1 (the first BMD measurement) was 1.031±0.01. The BMD of L spine improved in 58% of patients and worsened in 42% of patients. BMD of hips (H) generally worsened over the same time period, ratio H2 : H1 was 0.992 ±0.08. BMD of hips increased in 44% of patients and declined in 56% of patients. BMD of forearms was measured in 38 patients and decreased in 30 patients (78%). The bone cortical index BI = (TBW - M) : TBW in osteoporotic patients was 0.408, in patients with osteopenia 0.430 and in patients with normal BMD was 0.504 and showed good correlation with the bone density measured by DEXA p<0.01). When comparing BI, the value was significantly different among the osteoporosis, osteopenia group and normal BMD patients (p < 0,001; Kruskal Wallis test)

Patients did not differ significantly in age, creatinine, calcium and parathormone (PTH) level. There was a tendency to lower BMD with years after the kidney and pancreas Tx (Table 1)
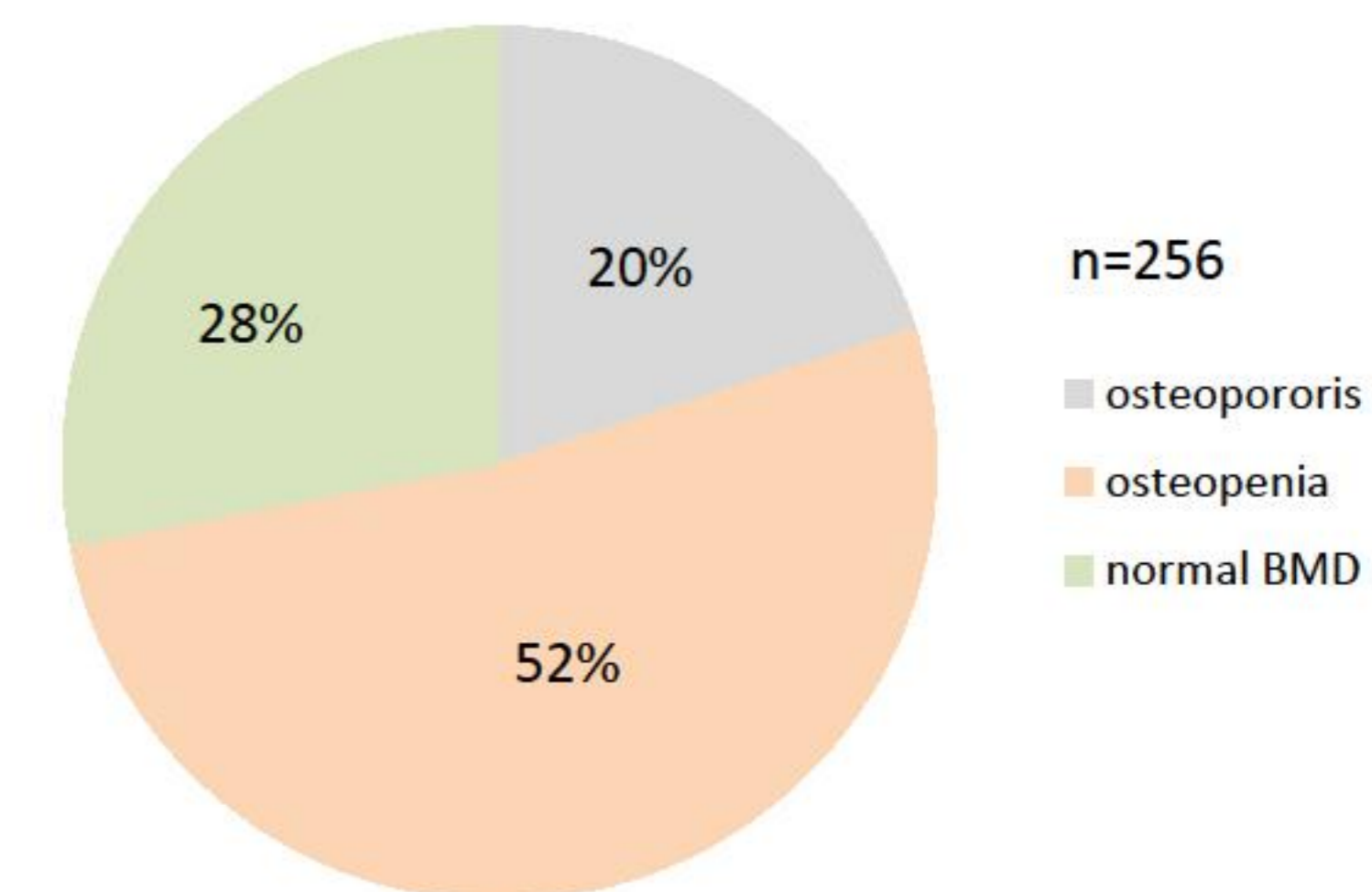

Fig 1 The prevalence of osteoporosis and osteopenia in patients after kidney and pancreas Tx
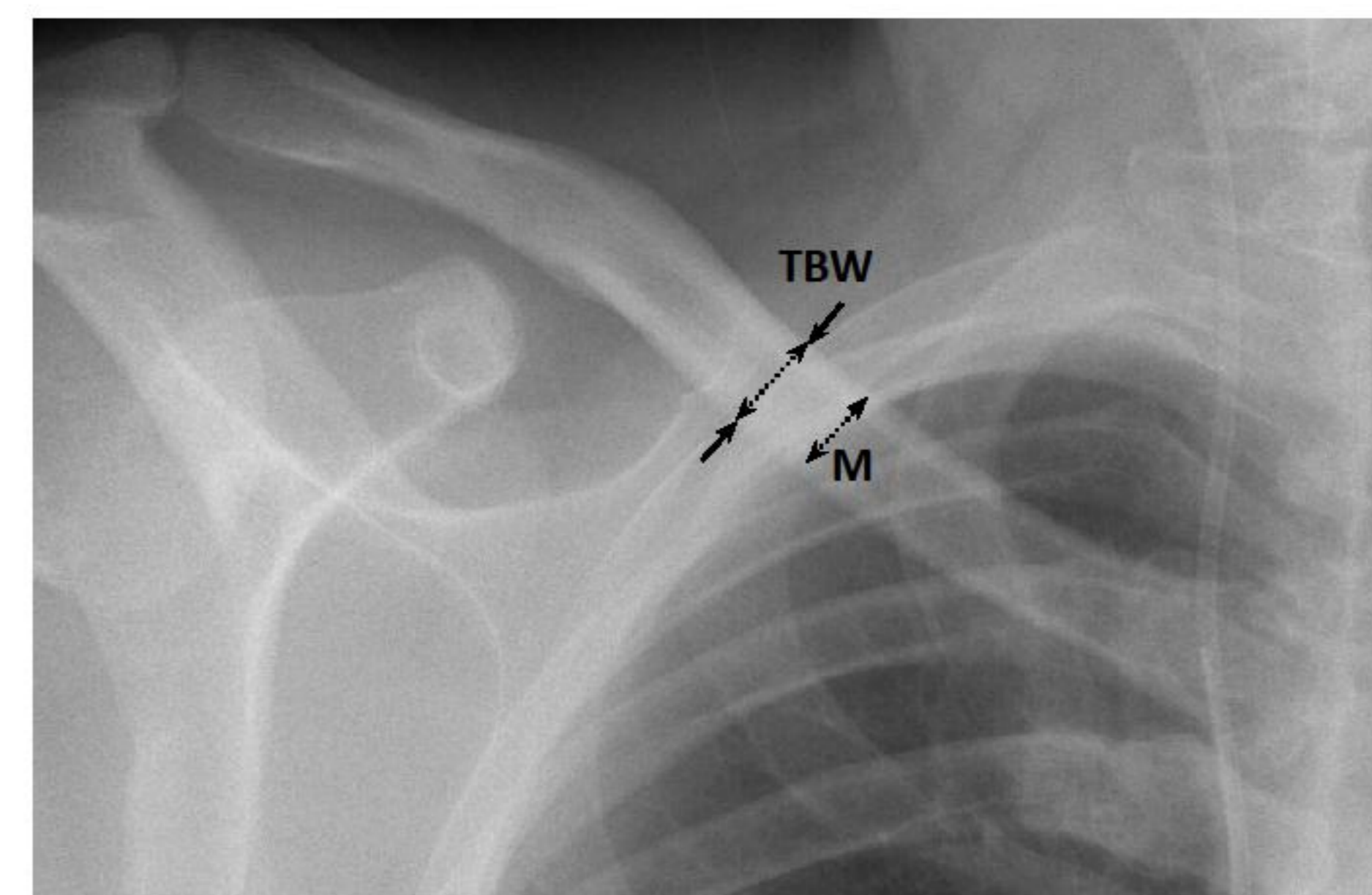
n=256
- osteopororis 20%
- osteopenia 52%
- normal BMD 28%

Fig 2 Detail CXR with bone cortical index measurement in patient with normal BMD. BI=(TBW-M):TBW (BI 0.49)
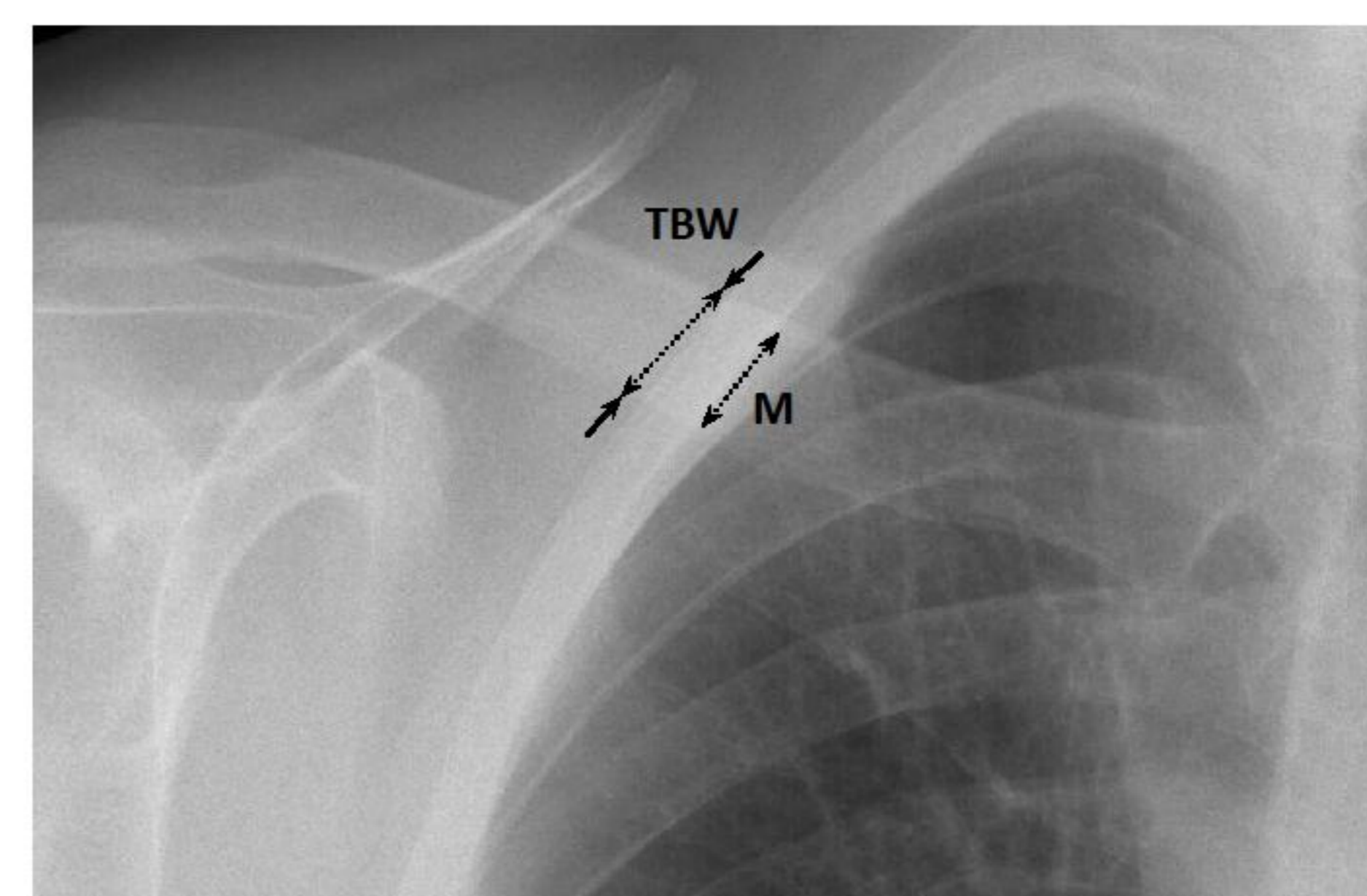

Fig 3 Detail CXR with cortical index measurement in patient with osteoporosis BI=(TBW-M):TBW (BI 0.31)

Table 1 Characteristics of patients with kidney and pancreas Tx

Patients	N	Age (years)	After Tx (years)	Creatinine (µmol/l)	Ca (mmol/l)	PTH (pmol/l)
Osteoporosis	53	51.7	8.4	147.7	2.4	14.6
Osteopenia	135	52.9	7.7	145.3	2.4	16.7
Normal BMD	68	54.6	6.8	147.3	2.4	13.8

Conclusion

Diabetic patients after kidney and pancreas transplantation have increased prevalence of osteopenia and osteoporosis (72%). Osteoporosis affects mainly the hips (94%) and distal forearm. Evaluation and managing of bone disease should be an integral part of pre- and after transplantation medical care.