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Computed Tomography in prostatic cancer

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Introduction:

Advances in diagnostic imaging have complemented DRE and PSA estimation in the detection and pre-therapeutic assessment of carcinoma of the prostate.

TRUS, CT,MRI and radio-nuclide bone scan are the predominant imaging modalities available today.

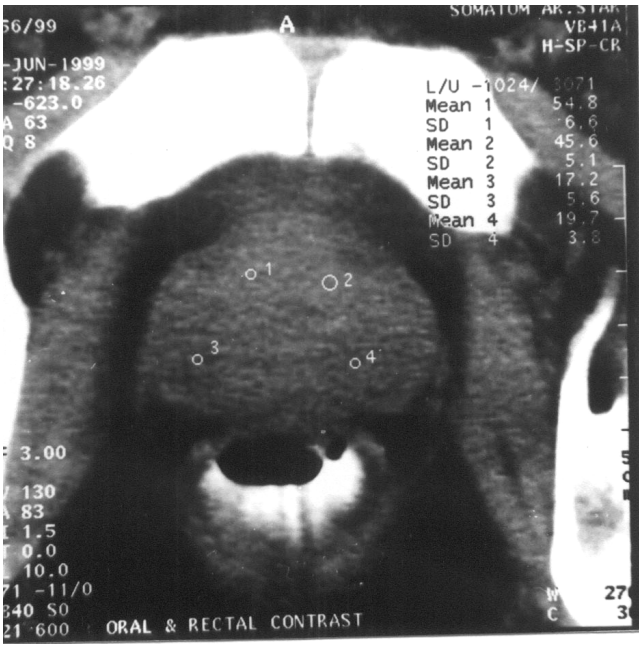

Fig 1: Plain CT scan showing clear delineation between central and peripheral zones. This differentiation can be appreciated on plain as well as contrast enhanced scans using 5mm collimation.The attenuation valves of the peripheral zone is between 17-19 HU.The central zone shows a density ranging between 46-55 HU.

CT has been widely perceived as an imaging modality of limited value in imaging prostatic cancers. It's accuracy in diagnosing even lymph node metastasis is considered up to 79% only, as microscopic invasion in normal sized or minimally enlarged nodes cannot be detected (1). It' s role is considered mainly in the staging of the disease, once it has been diagnosed (2). This view is based on the assumption that other than enlargement of the prostate, CT cannot detect prostatic disease. On the other hand, MRI ,using endorectal coil ,is considered more sensitive than CT (3).

In this article, we have attempted to show that it is possible to identify the two zones of the prostate in several cases , thereby enabling detection of prostatic disease if it affects the peripheral zone. Needless to say that as elsewhere ,tissue examination alone can determine the nature of pathology. However, when correlated with the patient's age, the possibility of malignancy can be suggested even in unsuspected case.

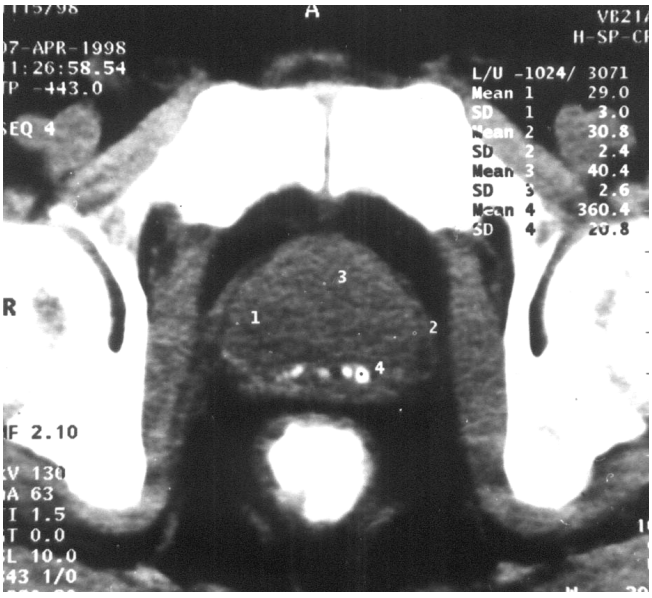

Fig2:Plain CT showing differentiation between the central and peripheral zone,appreciable inspite of prostatic calcification.

Material and method

The study was undertaken with a view to identify the two prostatic zones, central and peripheral, by CT.

Both plain and contrast enhanced scans were performed.

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Fig 3:Contrast enhanced CT scan shows clear delineation between the central and peripheral zones.The central zone is between 40-47 HU as compared to the peripheral zone which is between 15-21 HU.Note that the attenuation values do not show any significant difference as compared to the plain scans.

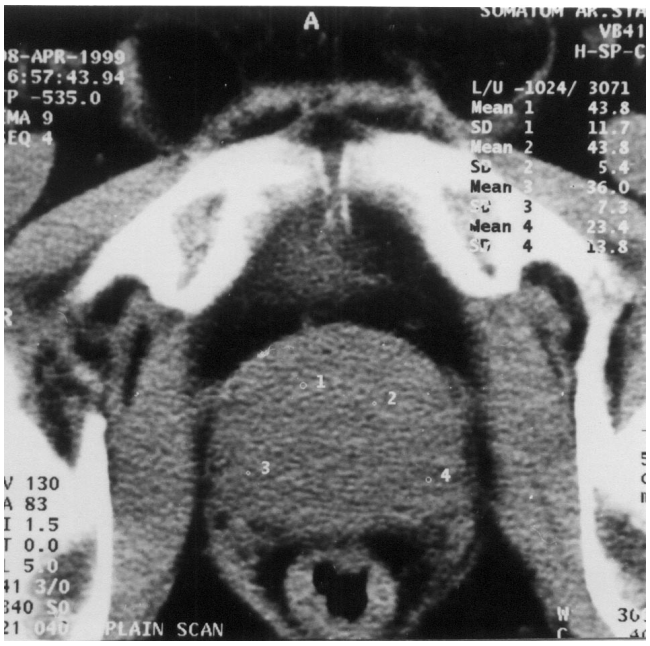

Fig 4:CT scan of a case of diffuse Carcinoma prostate: The attenuation value of theperipheral zone is between 24-36 HU as compared to the central zone which is 44 HU.

However, it was soon realized that plain scans were sufficient to delineate the anatomy and I .V contrast not necessary. This widened the scope of our investigation and we were able to obtain scans even in those elderly patients who were send for plain CT evaluation of some other region (e.g HRCT Chest, CT Head).

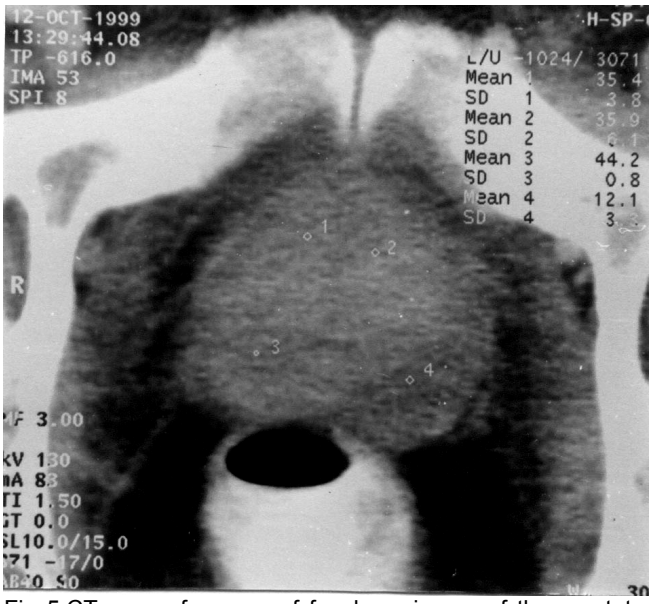

Fig 5:CT scan of a case of focal carcinoma of the prostate involving the right lobe. The attenuation value of the periphery of the right lobe is 33 HU as compared to the normal peripheral zone on the left side (12 HU).The central zone shows a value of 36 HU.

The study involved examining 30 controls (young patients, elderly patients with normal PSA levels) and 30 patients of proven prostatic malignancy. (FNAC proven and confirmed cases on follow up).

The scans were performed on Siemens Somatom ARC and Somatom Star scanners. 5mm thin sections were obtained from the base of the bladder till the apex of the prostate. The images were magnified and the HU values determined.

The central zone was normally denser than the peripheral zone with values ranging between 40 to 60 HU, as compared to 10-25 HU of the peripheral zone.

An increase in density of the peripheral zone ,over 25 HU and especially equaling that of the central zone, is suggestive of prostatic disease, which, could be a malignancy

The difference in these values was did not alter significantly after contrast administration. in our study.

Results

It was possible to establish the difference in the zonal anatomy in 57 % of the normal patients as compared to only 13 % of the diseased prostate. The differentiation was difficult in the presence of calcification or artifacts from rectal gas shadow or bones.

The difference was more apparent in the elderly patients as compared to the younger individuals and was evident

in both plain as well as in contrast enhanced scans in these cases.

83% of cancer prostate patients had altered zonal anatomy. Where ever the alteration was localized, we found it correlated with DRE, and biopsy was positive for carcinoma prostate. Diffuse loss of zonal differentiation was also seen in advanced prostatic cancers but was noticed in several BHP patients as well as in cases of prostatitis.

Discussion:

The normal prostate gland appears as an elliptical structure on CT scans with the central zone having an attenuation value similar to striated muscles (40-60HU) (4).The attenuation values of the peripheral zone is lower and in the range of 10-25 HU.

The zonal anatomy of the prostate can be distinguished on CT scan, both in plain as well as in the contrast enhanced studies (5) . As age advances, the probability of defining the zonal anatomy improves. Various explanations are offered and include ,enlargement of the gland due to development of BHP in the central zone, which results in increased density within the central zone, increased water content in the peripheral zone and the histologically more complex branching of the prostatic ducts in the central zone (6). Yoshizako et al,(7)suggested in their study, that it was possible to distinguish the zonal anatomy is 72% cases and where it is not distinguishable, disease might be considered. Microwitz (8)confined his study to normal anatomy, while Yoshizakso studied diseased prostates as well.

In our study of prostatic cancers, we found loss of differentiation between the central and peripheral zone due to increase in density of the peripheral zone. However we noticed similar findings in prostatitis as well as in BHP where the peripheral zone was compressed by the central zone. Nevertherless, a focal area showing increase in density, diffuse increase in peripheral zone density in normal sized glands as well as a generalized increase in density in an enlarged gland, prompted us to suggest further evaluation ,which yielded carcinoma in 83 % cases.

Conclusion:

CT scan, both plain and contrast can differentiate between peripheral and central zones, especially of enlarged prostates of elderly patients. This feature can help us in discovering prostatic disease, including cancers. The zonal anatomy must be carefully determined in CT scans which include the prostate as it might result in incidental discovery of early as well as indolent tumours.

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