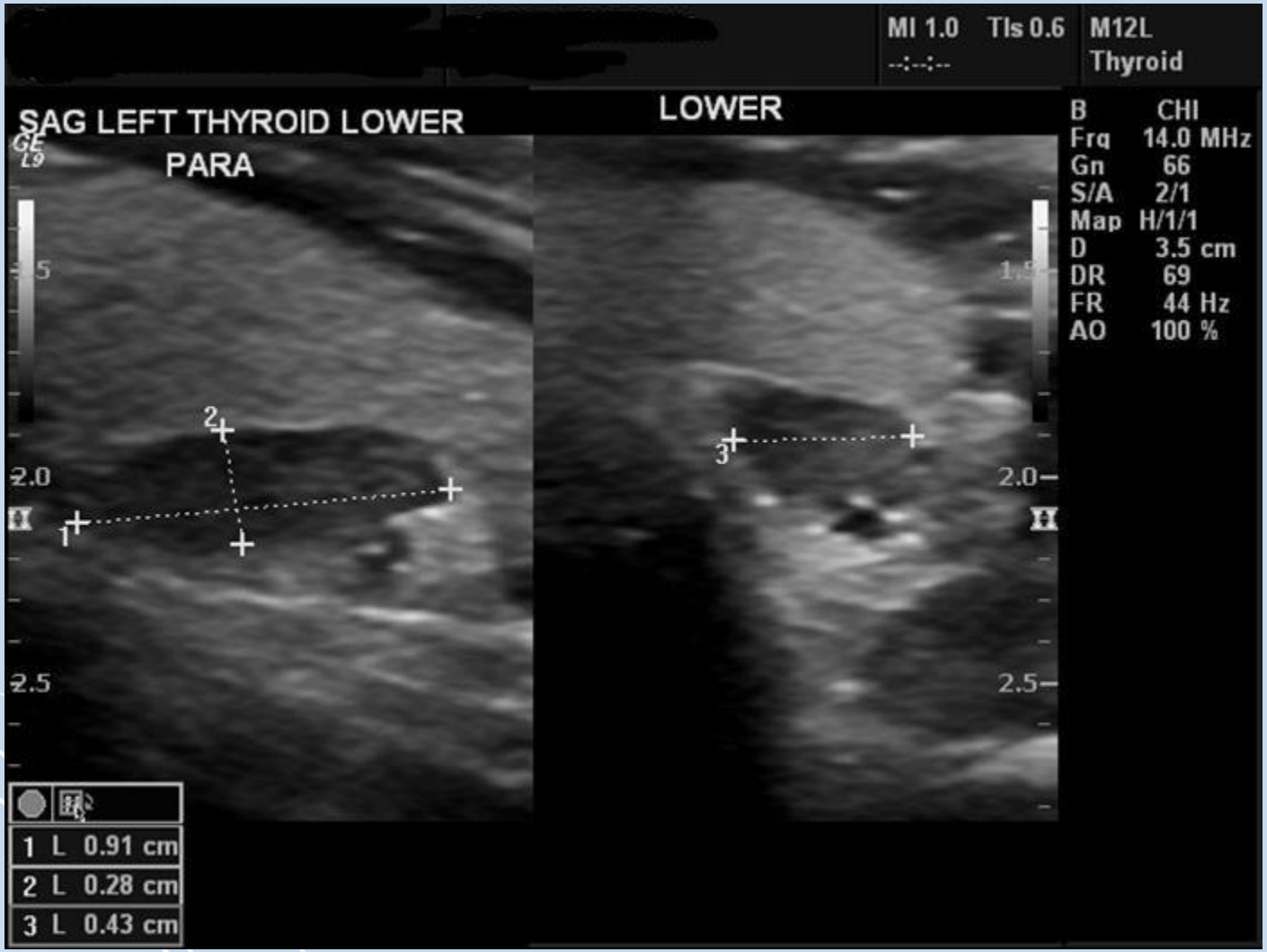
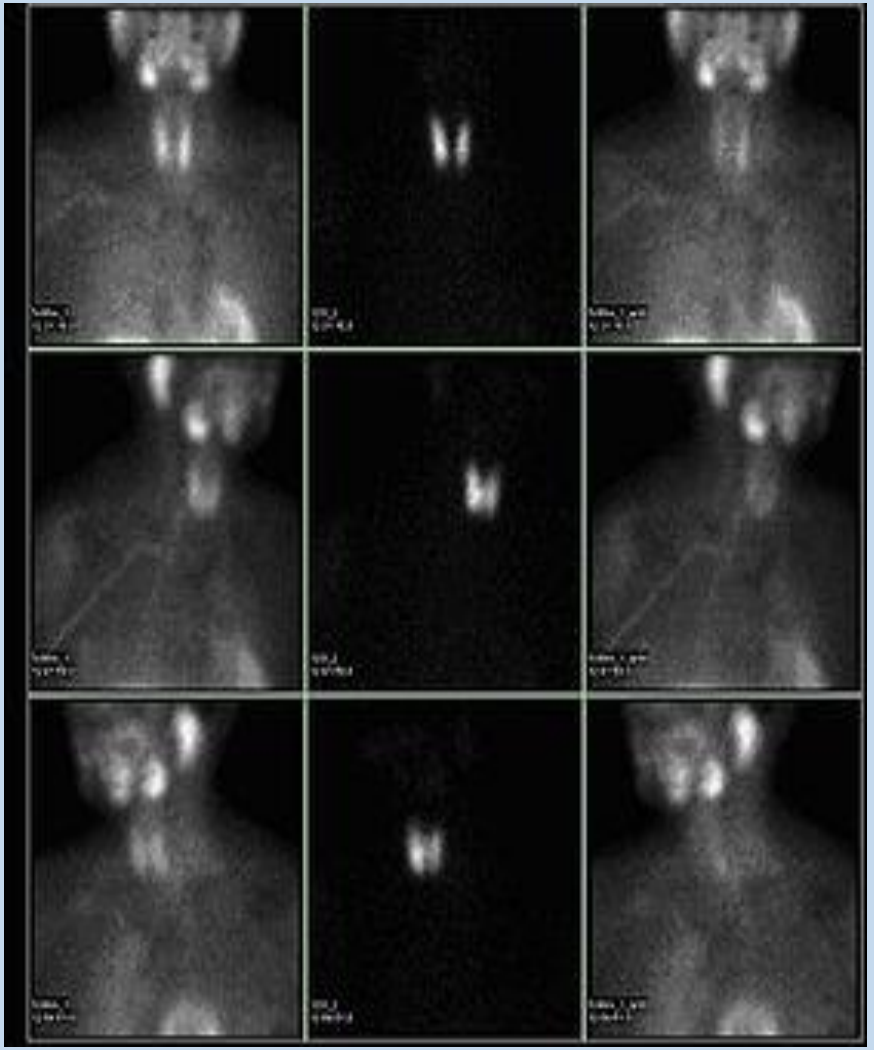

MI 1.0 TIs 0.6
--:--:--
M12L
Thyroid
SAG LEFT THYROID LOWER
PARA
LOWER
B CHI
Frq 14.0 MHz
Gn 66
S/A 2/1
Map H/1/1
D 3.5 cm
DR 69
FR 44 Hz
AO 100 %
2.0
2.5
1 L 0.91 cm
2 L 0.28 cm
3 L 0.43 cm

Doppler ultrasound

Can commonly show a characteristic extrathyroidal feeding vessel (typically a branch of the inferior thyroidal artery, which enters the parathyroid gland at one of the poles. Internal vascularity is also commonly seen in a peripheral distribution. This feeding artery tends to branch around the periphery of the gland before penetration. This feature can give a characteristic arc or rim of vascularity. The overlying thyroid gland may also show an area of asymmetric hypervascularity that may help to locate an underlying adenoma.

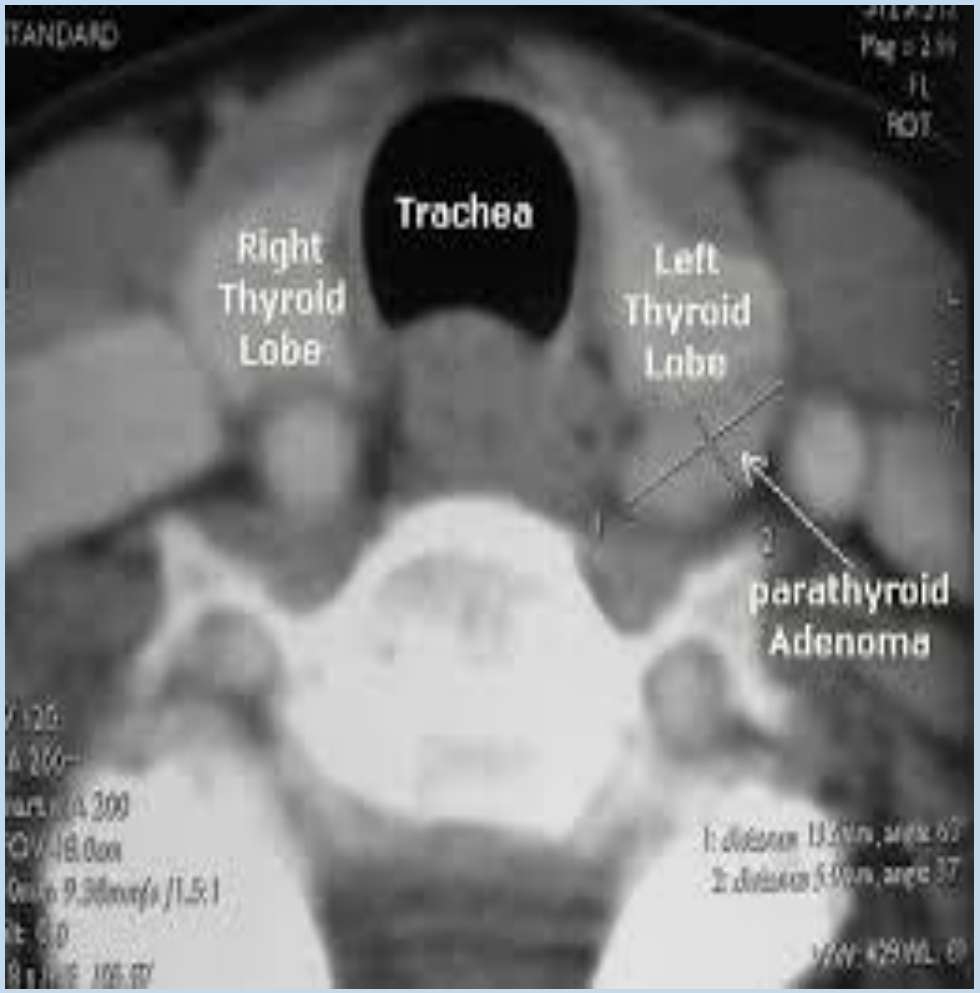
Nuclear medicine

Can be very useful for localizing the lesion when the site is not known. Shows increased uptake with agents such as technetium (Tc) 99m Sestamibi (MIBI) (commonly used agent) and Tc-99m tetrofosmin. The nuclear medicine scan can be fused with the CT scan as a SPECT scan to increase diagnostic accuracy and aid in anatomical localization. 18F-fluorocholine PET/CT may also have a role 18.



CT

In the past, CT was more commonly used in the setting of a failed parathyroidectomy for the detection of suspected ectopic glands (often mediastinal) 6. However, in recent years, 4D-CT has emerged as valuable modality especially in the era of minimally invasive parathyroidectomy. This type of surgery requires precise localization with anatomical detail and a confident diagnosis of parathyroid adenoma. 4DCT has been shown to be more sensitive than sonography and scintigraphy for preoperative localisation of parathyroid adenomas 13,15.



Enhancement on 4D-CT

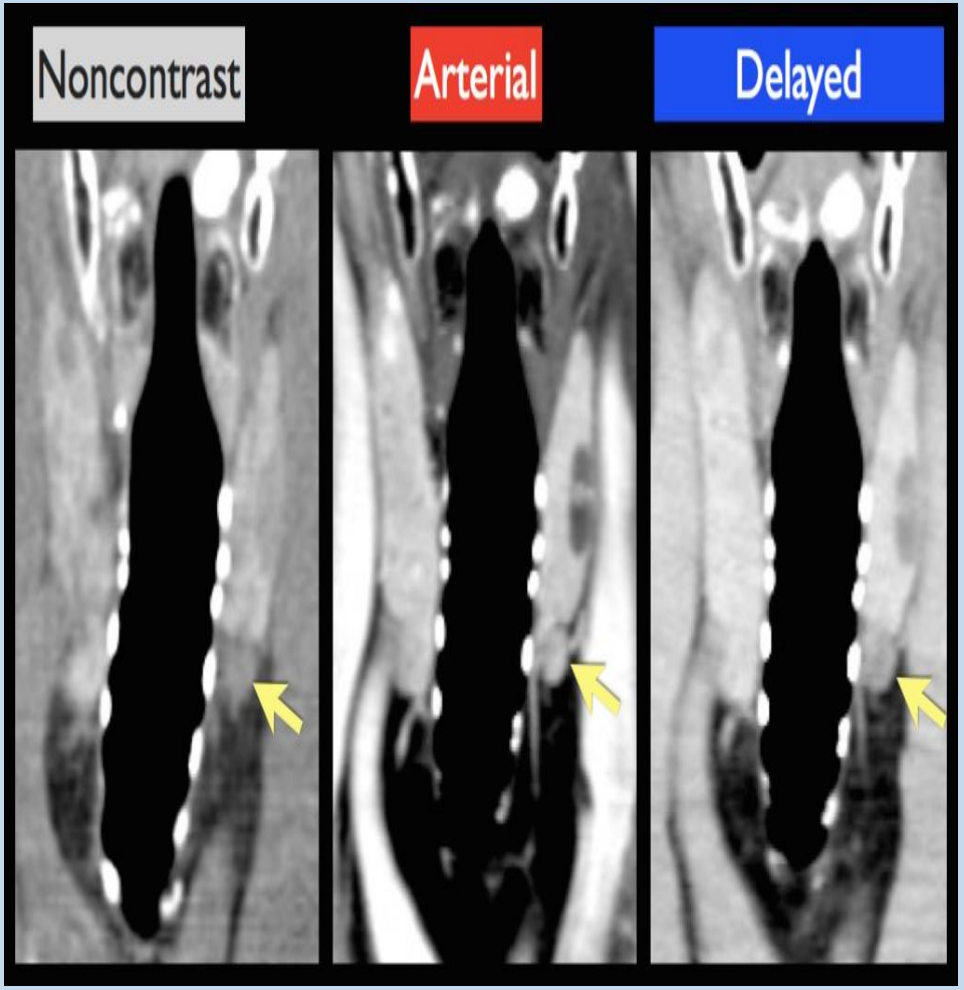
On 4D-CT parathyroid adenomas typically demonstrate intense enhancement on arterial phase, washout of contrast on delayed phase and low attenuation on non-contrast imaging.

Secondary signs include:

the polar vessel which represents an enlarged feeding artery or draining vein to the hypervascular parathyroid adenoma

a larger lesion size increases the confidence of diagnosis

parathyroid adenomas can also have cystic change



MRI

MRI is infrequently utilized in initial work up because of lower spatial resolution and artifacts. Adenomas can show variable signal intensity on MRI. Reported signal characteristics.

Differential diagnosis

The easiest way to separate hyperplasia and adenoma is to sample more than one gland. If more than one gland is enlarged or abnormal, if there is an increase in the parenchyma to fat ratio, and nodular distribution of both the chief and oncocytic cells, then hyperplasia should be considered. Clinical information about renal status, serum calcium levels, intraoperative serum PTH levels will help make the separation. Overall, the adenoma and hyperplasia diagnoses are to a great extent based on the macro- and/or microscopic findings in the remaining associated glands.

Parathyroid adenoma is grossly smooth, encapsulated mass with rim of uninvolved parenchyma adjacent to proliferation. Microscopically, a single histological population of enlarged cells, glandular architecture with secretions, atrophy, or compression of parathyroid parenchyma are seen. Immunohistochemical results are parathormone and chromogranin positive.

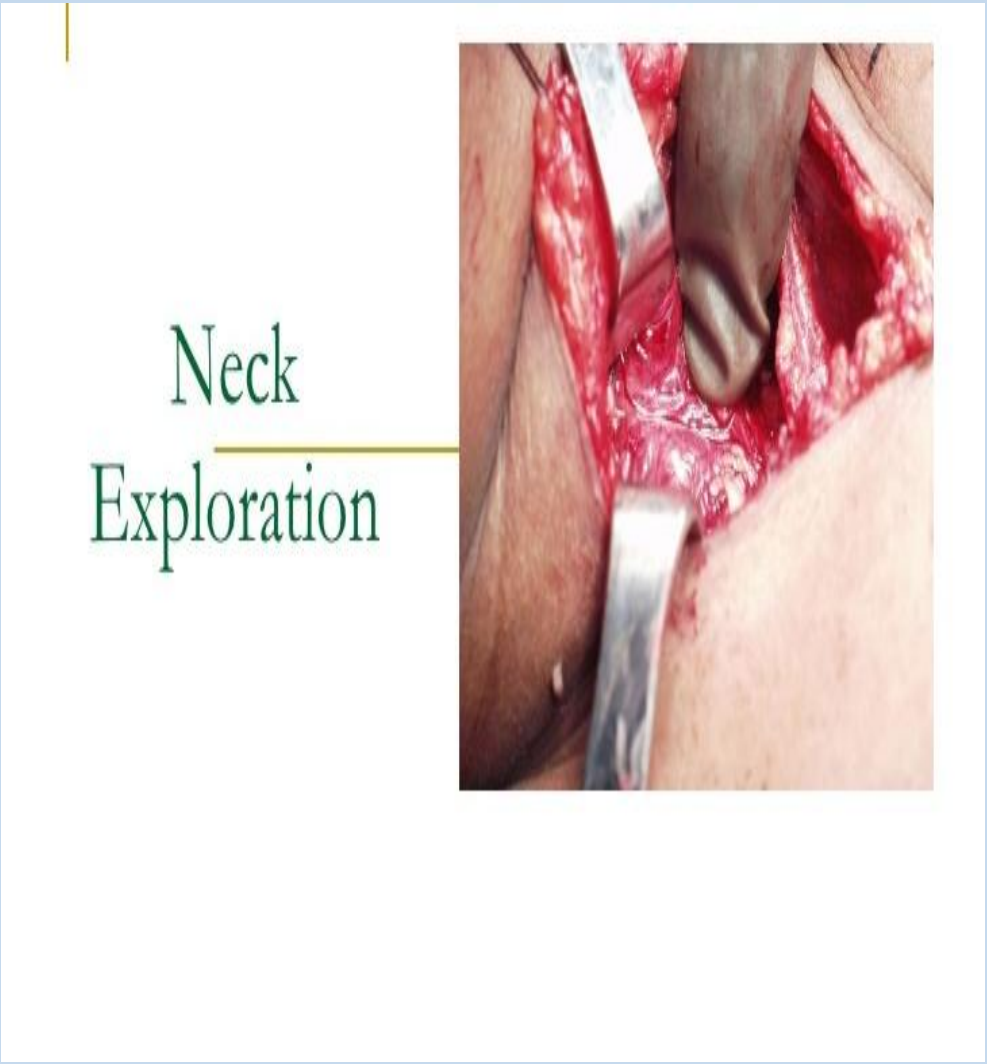
Parathyroid carcinoma usually has a trabecular architecture, thick acellular bands of fibrosis, capsular/vascular/perineural invasion, profound nuclear pleomorphism, prominent eosinophilic macronucleoli, increased atypical mitotic figures, and presence of comedo necrosis. Adherence to the thyroid gland, difficulty in removing the tumor and extremely elevated serum calcium levels should elevate suspicion of parathyroid carcinoma.

Thyroid lesions can cause diagnostic difficulty. Immunohistochemical staining for PTH, thyroid transcription factor-1, or thyroglobulin is helpful in this discrimination.

The distinction between an atypical parathyroid adenoma and parathyroid carcinoma can be quite a difficult one. Clinical findings in addition to the histological appearance should give the clue to correct diagnosis.

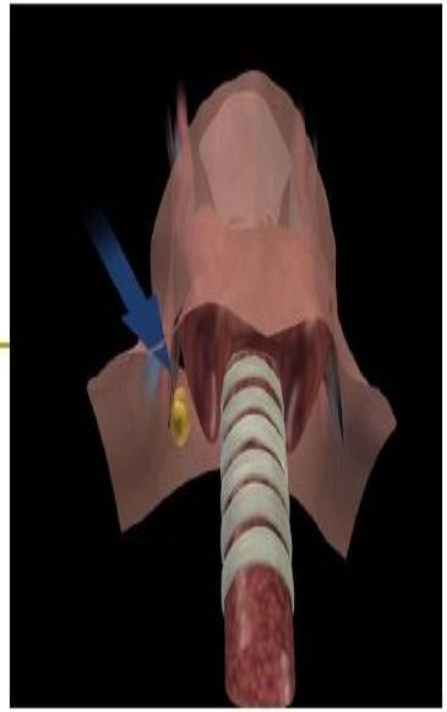
Treatment

Surgery is the only cure for parathyroid adenomas. It is successful about 95% of the time. Parathyroidectomy is the removal of the affected gland(s). The standard of treatment of primary hyperparathyroidism was formerly a surgical technique called bilateral neck exploration, in which the neck was opened on both sides, the parathyroids were identified, and the affected tissue was removed. By the 1980s, unilateral exploration became more common. Parathyroidectomy can now be performed in a minimally invasive fashion, mainly because imaging techniques can pinpoint the location of the tissue. Minimally invasive techniques include smaller open procedures, radio-guided and video-assisted procedures, and totally endoscopic surgery.



Mini-Incision Parathyroidectomy

Lateral Approach to Parathyroids



Before surgery is attempted, the affected glandular tissue must be located. Though the parathyroid glands are usually located on the back of the thyroid, their position is variable. Some people have one or more parathyroid glands elsewhere in the neck anatomy or in the chest. About 10% of parathyroid adenomas are ectopic, located not along the back of the thyroid but elsewhere in the body, sometimes in the mediastinum of the chest. This can make them difficult to locate, so various imaging techniques are used, such as the sestamibi scan, single-photon emission computed tomography (SPECT), ultrasound, MRI and CT scans.sometimes parathyroid adenomas can be ablated by ethanol injection ,guided by ultrasound.

What happens during surgery to remove parathyroid nodules?

Minimally invasive surgery can be done if the patient has only one adenoma or two adenomas on the same side of the neck. Anesthesia may be local or general, depending on the surgeon's judgment and the patient's preference.

On the day of surgery, patients sometimes receive another low dose of 99m Tc-sestamibi to guide the surgeon's incisions. An IV line is installed to measure the amount of parathyroid hormone in the patient's blood before and after the surgeon removes the affected glands.

When the enlarged glands are highlighted by 99m Tc-sestamibi, the surgeon removes them through an incision of approximately 2 cm (less than 1 inch). parathyroid hormone levels drop dramatically within 10 to 20 minutes after the surgeon successfully removes the glands with adenomas. If parathyroid hormone levels do not drop after the targeted glands are removed, the surgeon may switch to open-neck surgery to look for other adenomas.

The open-neck method is used instead of minimally invasive surgery for patients with adenomas on both sides of the neck or when preoperative imaging fails to locate one or more adenomas. The cure rates for open-neck and minimally invasive surgeries are similar.

What are the risks of having surgery?

All surgeries have risks. With parathyroid surgery, some patients experience:

Hoarseness from paralysis of the voice box (from damage to the voice box nerve; permanent hoarseness [about 3.5 percent of patients]).

Short-term or permanent low calcium levels in the blood (hypocalcaemia)

To reduce these risks:

A device can be used to monitor the nerve's location during surgery.

Hypocalcaemia can be treated with calcium and vitamin D supplements or by leaving at least part of one parathyroid gland in the neck.

Careful control of bleeding during surgery can reduce the risk of developing blood clots in the neck.

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