REVIEW ARTICLE

Involvement of Parathyroid gland in COVID-19

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Abstract

Introduction: Parathyroid glands are yellow brown, small and soft. Typically four parathyroids are present in posterior surface of thyroid. Parathyroid's numeral, size and site is inconstant. Corona virus disease-19(COVID-19) is a major problem all over world and aim of this study is to discuss possible involvement of parathyroid in COVID-19.

Materials and methods: The previous studies were used for this review study.

Results and discussions: The COVID-19 mainly causes pulmonary injury and respiratory failure. Virus was chiefly detected in respiratory pathway, gastrointestinal tract, sweat gland, pituitary, pancreas, adrenal, renal, parathyroid, liver and cerebrum. Nearly 65% of COVID-19 patients had hypocalcaemia. Advanced age and hypocalcaemia were bad prognostic factors for COVID-19 patients. Hypocalcaemia might be due to vitamin-D deficit, decreased bowel absorption of calcium, diminished secretion or response to parathyroid hormone (PTH). The PTH rises serum calcium by discharge calcium by osteoclastic activity, calcium reabsortion in nephron. Vitamin-D encourage reabsorption of dietary calcium. Thus inadequate Vitamin-D excites parathyrood to discharge more PTH.

Normal and abnormal parathyroids are identified by their size, form, consistency and histological judgments. There was association between size of parathyroid and PTH level. Glands of black populations were longer than white groups. Larger parathyroid secrets more PTH and might has greater number of chief cells. Microscopically quantity of fatty tissues and oxyphil cells rise in elders. Both transitional and oxyphil cells secrets PTH to extensive parathyroid stimulation.

Conclusion: Size of all parathyroids, patient's age, oxyphil cells amount, ethnicity, amount of PTH and Vitamin-D determines the serum calcium level in COVID-19.

Keywords: Parathyroid involvement, COVID-19, Vitamin-D therapy, Parathyroid hormone.

Introduction

Parathyroid glands are smaller endocrine structures and typically four glands are present in every individual with two on each side but the numeral, size and site of parathyroid glands is inconstant (1). The parathyroid gland commonly lies near to the posterior surface of thyroid gland underneath a thin film of fascia, encircled by fat globules. Parathyroid gland itself has a thin capsule. The parathyroid is a minor yellow-brown structure within the range of 35 -40 mg weight and 5×3×1 mm in dimension (2). Normal parathyroid glands are

light and pliable in consistency. This helps in distinguishing it from the other nearby anatomical structures (3). Lymph nodes might be firmer than the parathyroid glands.

The severe acute respiratory syndrome coronovirus (SARS- COV) has diseased millions of people and it creates a major community problem, cost-effective and health complications all over the world (4). It was documented about the effect of the coronovirus on the parathyroid gland (4). The aim of this review study is to discuss the possible involvement of the parathyroid gland in Corona virus disease-2019 (COVID -19) infection.

Materials and Methods

The previous documented literatures about the parathyroid and the involvement of parathyroid glands in COVID -19 patients were used for this review study.

Results and Discussion

The COVID-19 mainly causes pulmonary injury and severe hypoxic respiratory failure. The previous documented studies reported extrapulmonary expressions, gastrointestinal, neurological, cardiac, renal, cutaneous and ocular expressions of COVID -19. It was noticed that SARS-CoV was chiefly detected in lung, wind tube and pulmonary bronchus. Strangely it was noted in various structures and tissues including stomach, small intestine, sweat gland, pituitary, pancreas, adrenal, distal convoluted renal tubule, parathyroid gland, liver and cerebrum (4,5).

The hypocalcemia is a usual laboratory outcome in viral diseases and pneumonia (6). The similar finding was noted by an another study in that nearly 65% of patients with novel COVID-19 had hypocalcaemia (7). It was commented that the severe COVID-19 diseased patients (62.6%) with hypocalcemia had a poor consequence and additionally hypocalcemia forecast a worse prognosis of severe COVID-19 infection (8). They notices that the advanced age, raised altitudes of CRP and IL-6 and hypocalcaemia were the threat features for COVID-19 patients and those are the bad prognostic elements.

The reason for decreased serum calcium would be vitamin D deficit, hypoalbuminemia, decreased bowel absorption of calcium and diminished secretion of and response to parathyroid hormone (PTH) secondary to augmented levels of inflammatory cytokines (7).

The PTH motivates the bony cells to discharge calcium by osteoclastic activity of the bones and also rises serum calcium by the reabsortion of calcium in the convoluted tube and at the loop of Henle of the nephron. The vitamin-D encourage the reabsorption of dietary calcium and phosphorus. Thus inadequate vitamin-D excites the parathyrood gland to discharge more PTH (8). There might be the situation of deteriorating of hypoparathyroidism during the COVID-19 infection and it was advised to deliver the vitamin-D to the Covid-19 patients. The vitamin-D is acquired naturally from the sunlight. The positive role of vitamin-D

replacement therapy in COVID-19 patients was noted by reducing the risk and severity of the COVID-19 disease (9).

Anatomically normal and abnormal parathyroid glands were identified by their size, form, consistency and histological judgments. Rounded edge, rise in consistency were noted in parathyroid adenoma whereas sharp edge, soft in consistency were noted in ordinary parathyroid gland (10).

There were documented studies mentioned about the association between the size of the parathyroid and PTH values (11,12). A previous study commented that the length of normal parathyroid gland ranged from 3 to 9 mm in the Bangladesh population. The glands of black populations were longer than white groups of people (13). The larger parathyroid gland secrets more PTH and the larger gland might has the greater number of chief cells (12,14). The size of the parathyroid gland literally means the total size of overall total number of parathyroid glands in an individual.

Microscopically the parathyroid glands have two cells, the chief cells secrets the parathyroid hormone (PTH) and the other one is the oxyphil cells and the detail action of oxyphill cell is not understand till now (15). The histologically normal glands have acceleration of intracellular fat which lies with the cluster of chief cells and those fats seem to be compressing the chief cells but in abnormal gland, the stromal fat appears to be compressed by parenchymal cells (10).

The quantity of fatty matters rise with aging and consist of almost 50% of the gland bulk in high aged population. Similarly more oxyphil cells could be seen in elder people (16). Oxyphil cells present either as a single or in groups among the chief cells and they found to be bigger than chief cells and contain abundant huge mitochondria (16). The Oxyphil cells are absent in some species. Another type of cells named as transitional cells were noted in human parathyroid gland. Both transitional and oxyphil cells only answer and secrets the PTH to extensive period of stimulation of parathyroid gland (16). The involvement of the chief and oxyphil cells of parathyroid in COVID-19 patients in different ethnic groups need to be study in detail.

The site of location of parathyroid was assessed by using neck ultrasonography and parathyroid scintigraphy. It was pointed out that enlarged parathyroid gland might be the reason for bone problem and not the result of bone disease (17).

It was documented that COVID-19 might upset the role of parathyroid glands by two likely ways. First is by directly performing on parathyroid tissues by SARS- Cov -2 virus and secondly by lung failure (7).

Conclusions

The size of parathyroid gland, the alteration in quantity of different cells of parathyroid in different age group, ethnicity, the serum calcium and vitamin-D level determines the amount of secretion of PTH in COVID-19.

Conflict of Interest

None declared

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