Research Paper

Study of Effect of Hypothyroidism on Platelet Aggregability

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Abstract

Hypothyroidism is a common condition in which there is multisystem derangement of physiological functions due to lack of thyroid hormone. Various changes in the haemostatic profile have been described in patients with excess and deficiency of thyroid hormone. These changes could be encountered as complicating factors in various systemic disorders like cardiovascular disorders, endocrinal disorders and gynecological disorders like menorrhagia etc. The present study is focused upon one of the haemostatic parameter that is platelet aggregability in clinically confirmed hypothyroid population. As women are affected approximately six times more frequently than men and to avoid any possible gender bias all subjects taken for the study were female hypothyroid patients. Measurement of platelet aggregability was done by using ‘O’ Brien method. Result shows significant increase (P<0.05) in platelet aggregability in the study population. The study provides possible mechanism in thyroid dysfunction which modifies physiological process of primary and secondary haemostasis leading to bleeding or thrombosis as complication.

Keywords: Hypothyroidism, Haemostasis, Platelet Aggregability

1. Introduction

Thyroid disorder is probably one of the commonest endocrine disorders worldwide. According to a projection it has been estimated that about 42 million people in India suffer from thyroid disorders (Unnikrishnan & Menon, 2011) Hypothyroidism is commonest of all thyroid disorders in paediatric age group and pregnant women. Women are affected approximately six times more frequently than men by thyroid ophthalmopathy (Shah & Joshi, 2000 and Unnikrishnan & Menon, 2011).

Various changes in the coagulation and fibrinolytic system have been described in patients with excess and deficiency of thyroid hormone leading to cardiovascular complications and coagulation disorders. According to the recent literature, most of the coagulation/fibrinolytic abnormalities associated with thyroid dysfunction are the consequences of direct effects of thyroid hormones on the synthesis of various haemostatic parameters. Thyroid autoimmunity may also modify the processes of secondary haemostasis. Both hypercoagulable and hypocoagulable states including increased fibrinolytic activity have been reported in hypothyroidism (Erem, 2011).

Hypothyroidism which is commonest of the thyroid disorders is frequently associated with bleeding disorders ranging from menorrhagia to thromboembolism. Many hemostatic derangements have been documented (Ford & Carter, 1990) including platelet aggregation disorder (Gardikas et al, 1972; Edson et al, 1975 and O’Regan & Frong, 1978), altered fibrinolytic activities (Chadarevian et al, 2001), decreased platelet factor 3 (Nordoy et al, 1976), altered platelet adhesiveness (Edson et al, 1975 and...
2. Materials and Methods

Male and female have different pattern of platelet and fibrinolytic parameters and as hypothyroidism is more common in female population, in present study only female patients have been included as subject. The study group includes 32 females of 35 to 45 years of age group; all suffering from mild hypothyroidism (TSH value 10-50µ/L). Patients with evidence of renal, heart, liver disease and those who had been exposed to medication influencing platelet aggregability were excluded. 32 healthy volunteers with similar age group and sex had been selected as control. Before the study it was made sure that none of the control group individuals are suffering from any thyroid disorder. This was done by doing clinical examination in detail and important biochemical investigations.

2.1. Method

Blood samples were collected in the morning between 8 am to 10.30 a.m. The time was kept fixed to avoid the effect of diurnal variation on platelet aggregation. 5 ml of blood was collected by venipuncture, mixed with 3.8 % trisodium citrate in a plastic centrifuge tube and was centrifuged at a rate of 1300 rpm for 15 minutes. The Platelet Rich Plasma (PRP) thus obtained was used for platelet aggregability. Platelet aggregability can be measured by various methods like by noting platelet aggregation time by use of aggregometer and Chander’s tube, ADP induced platelet aggregation etc. (Hofbauer & Heufelder, 1997). ADP induced platelet aggregation method has been used in the present study as this method is feasible, cheap and fairly accurate.

2.2. Procedure for Platelet Aggregability

Colorimeter was adjusted for an operative wavelength of 550 nm in such a way that the absorbance for the dark was at infinity (α) and for distilled water at zero. It was kept constant for each test. 2 ml of PRP obtained, as described above, was taken in a test tube and kept in preset colorimeter and absorbance reading was obtained. Then 0.1 ml (200 µg/ml) of ADP solution was added and absorbance reading was taken at the end of every 20 seconds and result expressed as platelet aggregation in sec. A decreasing absorbance (or in other words increasing optical density, OD) indicated increasing platelet aggregability.

3. Result and Analysis

Statistical analysis has been done by applying Student’s ‘t’ test using statistical software Medcalc (version 11.6.1.0). The level of significance has been taken as P value < 0.05.

Table 1 shows the mean OD (which is directly associated with platelet aggregability as detailed earlier) in both control as well as study group. The mean OD in study group was 0.043 + 0.007882 as against 0.03215 + 0.01323 in control group. The p value was found to be 0.007 which is highly significant statistically. The result indicates that the platelet aggregability was significantly higher in study group than in the control group.

4. Discussion

The present study was focused on the effect of hypothyroidism on platelet aggregability. The results in the present study indicate a significant increase in platelet aggregability in hypothyroid patients as compared to euthyroid healthy subjects. The probable mechanism for increase in platelet aggregability in hypothyroidism may be altered intermediary metabolism. This includes hyperlipidemia particularly hypercholesterolemia (Morris et al, 2001) which is responsible for changes in the platelet membrane composition leading to decreased fluidity of the membrane thus causing increased activation and adhesiveness of platelets. It may also be responsible for endothelial injury by various mechanisms which potentiate aggregability. Hagiwara et al (1989) studied the phosphorylation of Myosin Light Chain (MLC) which was higher in patients of hypothyroidism than control group (Hagiwara et al, 1989 and Mamiya et al, 1989). Platelets
obtained from study group have shown the property of spontaneous aggregation, degree of which was significantly higher than those of control group. This correlated well with basal MLC phosphorylation suggesting it is an important factor in the causation of hyperaggregability. Although the pathogenesis of atheroma is not clear but studies shown to have increased sensitivity to aggregating agents by increasing nucleotide release from platelet leading to thrombotic complication in untreated or undertreated patients with hypothyroidism (Giannattasio et al, 1997 and Krasner et al, 1997). Final result is an imbalance between the factors causing thrombus formation and those causing dissolution, favouring the former; thrombus so formed initiates platelet aggregability. Platelet aggregation has been documented to return to normal level when the euthyroid condition was obtained in the patients following administration of antithyroid drugs or thyroid hormone (Masunaga et al, 1997).

5. Conclusion

The result clearly indicates that hypothyroidism significantly increases platelet aggregability. As an extension to the above conclusion it can be proposed safely that cardiovascular complications arising as a co-morbid condition in cases of hypothyroidism could possibly be one of the implications of increased platelet aggregability in hypothyroidism. There is scope for further studies with larger database to confirm the findings of the study.

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References


Berry, J. (1901) Diseases of the Thyroid. P. Blakiston's Son.


