Frequency of Hypothyroidism in Patients with Atrioventricular (AV) Blocks

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ABSTRACT

Aim: To assess the frequency of hypothyroidism in cardiac patients having atrioventricular block.

Methods: 200 consecutive patients having 2nd & 3rd degree AV block on 12 lead ECG, and bradyarrhythmia (heart rate ≤40 bpm on 24 hours reading of Holter monitor) were included in the study. Thyroid function tests were done to assess thyroid function. TSH ≥5 mIU/L, with T4<2 ng/L as overt or without T4<2 ng/L as subclinical hypothyroidism. The type and location of AV block was determined. Data was recorded on proforma and analyzed through SPSS v. 21.0.

Results: Out of 200, hypothyroidism was detected in 6 (3.0%) cases. Insignificant difference was found for type and level of AV blocks amongst those with overt and subclinical hypothyroidism.

Conclusion: Hypothyroidism is present in only a fraction of patients with AV blocks. What needs to be established is whether there exists a causal relationship between hypothyroidism and AV block as majority of the cases didn’t improve with levothyroxine and required permanent pacemaker placement.

Keywords: Overt hypothyroidism, Subclinical hypothyroidism, Atrioventricular (AV) block

INTRODUCTION

Thyroid hormone affects the myocardium in multiple ways. It has direct dromotropic, inotropic & chronotropic properties like those observed with adrenergic stimulation.¹ Possible ECG abnormalities observed in hypothyroidism consist of sinus bradycardia, compacted P-waves, compacted or inverted T-waves, low voltage & deformed intraventricular conduction²

Reasons for AV block include fibrosis & sclerosis of conduction system, ischemic heart disease, raised vagal tone or some medicines. The pathophysiology behind AV block in hypothyroidism is unknown. A plausible explanation could be the lack of chronotropic and dromotropic effects of thyroid hormone coupled with the fact that hypothyroidism is linked to increased atherosclerosis secondary to hyperlipidemia. This can in turn lead to ischaemic heart disease in the long run thus causing the AV block.

AV blocks are rarely seen in patients with hypothyroidism. In a study investigating the various causes of AV blocks amongst Pakistani population, hypothyroidism accounted for 0% of the cases³. A recent study by Ozcans et al⁴ showed that hypothyroidism accounts for 4.3% of all the cases with AV blocks. This study was the only major study to date investigating AV blocks in patient with thyroid dysfunction.

AV block can lead to extreme bradycardia resulting in syncope owing to the decreased cardiac output⁵ It is important to investigate thyroid dysfunction in these patients as it is considered as one of the reversible causes of AV blocks⁶. However, this notion is partly true as Ozcans et al⁶ concluded that AV blocks due to hormone insufficiency in hypothyroidism constitute only a fraction of cases as thyroxine administration did not reverse the block in majority of the cases thus requiring permanent pacemaker. Existing literature is quite deficient in this topic. Not even a single case report has been published in this regard from Pakistan. This prompted us to do this study to determine the frequency of hypothyroidism in patients with AV block as confirmed via 12 lead ECG.

MATERIALS AND METHODS

This cross-sectional study was done from 1st July 2017 to 31st December 2017 at Cardiac centre, Jinnah Hospital, Lahore. Sample size of 200 patients of AV block was with 95% confidence interval and 3% margin of error and obtaining frequency of hypothyroidism 4.3%⁴ in patients with AV blocks. Patients with AV block (2nd or 3rd degree) detected on 12 lead ECG were included with bradyarrhythmia (heart rate ≤40 bpm on Holter monitor reading of 24 hours). Patients with other comorbid conditions including myocardial infarction, electrolyte disturbances, digitalis toxicity, or vasovagal syncope, patients taking beta blockers, non-dihydropyridine calcium-channel blockers, and class I and III antiarrhythmic were not included in the study. Non
probability consecutive sampling technique was used to enroll the patients. Written informed consent was taken in each case after explaining all the pros and cons. Blood sample was taken and serum separated after ultracentrifugation. Thyroid function was evaluated through levels of T4 & TSH by using ELISA method. TSH level≥5mIU/L was considered as hypothyroidism. Overt hypothyroidism was labeled when T4<2 ng/L while subclinical hypothyroidism was labeled when T4 >2ng/L. Type (2nd or 3rd degree block) and location (AV nodal, infranodal or undetermined) was confirmed through characteristic ECG findings as shown in Table 1.

Data was collected through proforma pre-designed for study purpose. All the collected data was then analyzed through SPSS version 21.0. Qualitative variables like gender, type and location of AV block and type of hypothyroidism (overt vs subclinical) were presented as frequency and percentage. Mean±SD were computed for quantitative variables like age. Chi-square test was applied to compare type and level of AV block in patients with overt or subclinical hypothyroidism with p-value≤0.05 as significant.

RESULTS

A total of 200 patients were enrolled. 60% of them were females while 40% were males. Mean age was 57±14.65 years with patients ranging from 41 to 76 years old. Mean heart rate at presentation was 37±4.09 bpm. 73% of the patients had second degree AV block. The most frequent level of AV block was AV node accounting for 58% of the cases (Table 1). Hypothyroidism was present in 3% of the cases. 4 patients had overt hypothyroidism while 2 were having subclinical hypothyroidism. There was insignificant difference in type and level of AV blocks in both hypothyroid groups (p-value of 0.33 and 0.60 respectively) (Table 2 and 3). 5 of the patients required permanent pacemaker placement whereas only 1 improved with administration of levothyroxine.

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<thead>
<tr>
<th>Frequency (%)</th>
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<tbody>
<tr>
<td>Gender</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Type of block</td>
</tr>
<tr>
<td>2nd degree</td>
</tr>
<tr>
<td>3rd degree</td>
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<tr>
<td>Location of AV block</td>
</tr>
<tr>
<td>AV nodal</td>
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<tr>
<td>Infranodal</td>
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<td>Undetermined</td>
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DISCUSSION

Higher degree AV blocks especially complete heart block is a medical emergency and requires prompt management. There are numerous case reports in the literature reporting complete heart block in hypothyroid patients. All of these case reports concluded hypothyroidism to be a reversible cause for AV block as it resolved upon levothyroxine administration. However, Ozcan et al showed that this is not necessarily true as they found out that less than one quarter of patients improved after thyroxine administration. They further called upon the need to confirm the results with conclusions that can be attained through large sample size in future.

Our study showed that hypothyroidism was present in 3% cases. This was in contrast to results of study of Zeb et al who found not a single case of hypothyroidism among 127 patients with AV block. However, our results were comparable to the findings of Ozcan et al who reported hypothyroidism in 4.3% of the patients. Another recent study by Sundhu et al found out 6.4% of the patients with AV blocks to be suffering from hypothyroidism. This doesn’t necessarily imply that hypothyroidism was primarily responsible for the AV block in these patients as most of these patients required permanent pacemaker placement as noted earlier by Ozcan et al. Insignificant difference has been detected for type and level of AV blocks in patients with overt and subclinical hypothyroidism. This was consistent with the finding of Ozcan et al.

There are several limitations to our study. Unlike Ozcan et al, we did not investigate hyperthyroidism in patients with AV block. Moreover, our sample size was much smaller and as pointed out by Ozcan et al, future large scale studies are warranted to confirm the findings. What needs to be particularly investigated is the reversibility upon thyroxine administration as reported previously, though the
results of our study go against this notion in concordance with the findings of Ozcan et al. Since there was not even a single case report from Pakistan, we decided to go on with a preliminary study.

CONCLUSION

Hypothyroidism is present in only a fraction of patients with AV blocks. Future large scale studies are warranted to establish causality between hypothyroidism and AV block as majority of the cases didn't improve with levothyroxine and required permanent pacemaker placement.

REFERENCES