Serum Haptoglobin in Cases of Ischemic Heart Diseases

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SUMMARY

Serum haptoglobin (Hp) was estimated in 76 cases of ischemic heart diseases (IHD) and 151 healthy individuals. A statistically significant rise in Hp level was observed in IHD cases. The rise was independent on the age and blood type of the cases but was more predominant in males as compared to females.

The increase in Hp level was noticed after the third day of coronary attack and peak level was obtained between the 7th to 9th day. Hp level was closely related to the degree of myocardial damage. No rise was seen in cases of angina whereas maximum rise was noticed in patients with multiple infarcts.

Hp phenotype pattern in IHD cases was not different from that of control cases.

Additional Indexing Words:

Haptoglobins Importance in myocardial infarct

SERUM haptoglobin level has been used as an indicator of the degree of activity of various diseases particularly those characterized by the tissue destruction,^{1,2)} malignancy,³⁾ renal disorders,⁴⁾ and myocardial infarction. Increasing levels of haptoglobin (Hp) in ischemic heart diseases (IHD) have been observed by different workers⁵⁾⁻⁹⁾ and a close correlation between the Hp level and extent of heart damage has been reported.

The present communication deals with the observations on serum Hp level in cases of IHD and its diagnostic and prognostic significance in these cases.

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MATERIAL AND METHODS

Serum Hp level was estimated in 76 cases of IHD admitted to the Jawaharlal Nehru Medical College Hospital, Aligarh Muslim University, Aligarh and 151 cases of normal healthy individuals. The diagnosis of IHD was established on the basis of clinical history, EKG changes, and serum enzymes estimation.

Serum Hp level was estimated spectrophotometrically by the method of Owen et al.¹⁰⁾ Hp phenotyping was done on polyacrylamide gel according to the method of Davis.¹¹⁾

RESULTS

Out of 76 patients 62 were males and 14 females. The serum Hp level in these cases as compared to that of control cases has been shown in Table I. The rise in Hp level in IHD cases was found to be statistically significant ($p < 0.05$). Hp level was not related to the age and blood type of the cases but a significant difference was obtained between the Hp levels in cases of males ($133.45 \text{ mg}\% \pm 41.82$) and females ($117 \text{ mg}\% \pm 22.07$). Thus in IHD cases a significant rise in Hp level was noticed in both sexes but it was more in males as compared to females.

Hp level and EKG changes:

A close correlation between the 2 was noticed (Fig. 1). In cases of angina pectoris with no EKG changes or of old or healed myocardial infarct no significant difference was observed in the value as compared to that of control cases ($p > 0.05$). But in cases of cardiac ischemia the values were significantly high and the rise was very much closely related to the extent of the cardiac damage. Maximum rise was seen in cases with multiple infarcts (average value being $171.47 \text{ mg}\%$) as compared to those with single infarct ($136.15 \text{ mg}\%$) and of myocardial ischemia ($115.28 \text{ mg}\%$). The difference in Hp levels in cases with different grades of EKG change was found to be sta-

Table I. Hp Level in Cases of IHD

Cases	Number	Hp (mg/100 ml)		
		Range	Mean	S.D.
1. Male (IHD)	62	80.0-366.6	133.45	41.82
2. Female (IHD)	14	58.5-131.2	117.26	22.07
3. Total (IHD)	76	80.0-366.6	130.11	39.65
4. Male (Control)	126	54.3-175.0	100.75	21.58
5. Female (Control)	25	58.5-131.2	94.07	23.15
6. Total (Control)	151	54.3-175.0	100.31	20.88

1:2 ($p < 0.05$), 1:4 ($p < 0.05$), 2:5 ($p < 0.05$), 3:6 ($p < 0.05$).

Fig. 1. Relationship between serum haptoglobin (Hp) level and day of infarct, SGOT and electrocardiographic changes in ischemic heart disease.

tistically significant ($p < 0.05$).

Hp level in relation to the day of infarct and SGOT levels:

No significant rise was noticed upto first 3 days, however, later on a gradual and significant rise was noticed reaching to a peak level between the 7th and 9th day of the illness (Fig. 1). The average value for Hp between the 7th and 9th day of infarct was $172.14 \text{ mg}\% \pm 15.93$. Thereafter a gradual fall was observed and the normal values were again obtained after a month in most of the cases.

In 11 cases repeated estimations of Hp level at frequent intervals also showed the same pattern i.e. a peak rise between the 7th to 9th day and then a gradual fall (Fig. 2). In 1 case Hp level was estimated after 4 months and the value was $86 \text{ mg}\%$. Out of 8 cases admitted in cardiogenic shock, 2 cases with Hp level above $200 \text{ mg}\%$ on the 7th day expired whereas those below $200 \text{ mg}\%$ survived.

No definite correlation was seen between the Hp level and SGOT values. It can only be said that the significant rise of Hp level was noticed after the third day, when the SGOT value had already started receding.

Hp phenotyping:

Hp phenotyping was done on polyacrylamide gel in 40 cases of IHD

Fig. 2. Relation of serum haptoglobin level (Hp) and day of infarct in ischemic heart disease.

Table II. Hp Types in Cases of IHD

Cases	Number	Hp phenotype			Hp frequency	
		1-1	2-1	2-2	Hp ¹	Hp ²
IHD cases	40	2 (5.00)	8 (20.00)	30 (75.00)	0.150	0.850
Control cases	50	2 (4.00)	8 (16.00)	40 (80.00)	0.120	0.880

and 50 control cases. The genotype frequency of Hp¹ and Hp² was 0.150 and 0.850 respectively as compared to those of control cases (0.120 and 0.880 respectively). No significant difference was found in the distribution of various phenotypes in 2 categories of cases (Table II).

DISCUSSION

In the present study a rise in the Hp level was noticed in cases of IHD as had also been observed by others^{5), 6), 12)} though the peak level was observed on different days. Owen et al⁵⁾ noticed the peak level on the third day of coronary attack but Agostoni et al^{8), 13)} have reported a rise of Hp level from the third day and the peak level reaching on the 6th day and values returning to normal in about 2 months. The observations in the present study were in

conformity with those of Agostoni et al.⁸⁾

The rise of Hp level was more in male patients as compared to females though in control cases Hp level was more or less the same in either sex. This disparity could be accounted for by the hormonal make up of the females which provided a protective role against IHD hence the incidence of the disease as well as its severity is low in females as compared to their male counterparts.¹⁴⁾

The increase in Hp level was closely related to the EKG changes (Fig. 1). These results correlated well with the observations of Agostoni et al.⁸⁾ but were contrary to the findings of Bisariya et al.⁹⁾ who failed to get any close relationship between the rise of Hp level and extent of cardiac damage.

Conflicting views have been expressed about the rise of Hp in cases of IHD. Jayle and Coumel¹⁵⁾ were the first to report high level of Hp in IHD cases and considered that inflammation of the arterial wall was responsible for the rise of these proteins. Their views were further supported by others.^{16),17)} Agostoni et al.⁸⁾ on the other hand have suggested that the tissue injury is responsible for stimulating liver for excess production of this protein to be utilized in the process of healing at the site of infarct. Hence the peak level was seen on the 6th day when the healing was maximum. The observations of the present study (a peak level on the 7th to 9th day) also support the views of Agostoni et al.⁸⁾ The excess protein liberated by the liver is entrapped within the injured tissue and provides the supporting background for the scar formation.

The relative risk of myocardial infarction in Hp 1-1 individuals was 1.33 as compared to Hp 2-2 individuals. Thus no genetic predisposition to the disease process is noticed as far as Hp is concerned.

The authors came to the conclusion that estimation of Hp level in cases of IHD as such had no diagnostic importance but an increase in Hp level was very much closely related to the extent of tissue damage and thus Hp estimation could be used for prognostic purpose.

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REFERENCES

1. Murray RF, Robinson JC, Dublin TD, Elaine LP: Haptoglobin and rheumatic fever. *Brit Med J* 1: 762, 1966

2. Bogdanovich L: Serum haptoglobin as an index of the activity of pulmonary tuberculosis. *Probl Tuberk* **46**: 65, 1968
3. Mueller WK, Handschumacher R, Wade ME: Serum haptoglobins in patients with ovarian malignancies. *Obst & Gynec* **38**: 427, 1971
4. Nyman M: Serum haptoglobin. Methodological and clinical studies. *Scand J Clin Lab Invest* **11** (Suppl 39): 1, 1959
5. Owen JA, Smith R, Padanyi R, Martin J: Serum haptoglobins in disease. *Clin Sci* **26**: 1, 1964
6. Jayle MF, Poumailloux, Maruy A: Interet du dosage de l'haptoglobins et du seromucoide chez les malades atteints de coronarite oblitterante. *Cah Coll Med Paris* **6**: 3, 1965
7. Jayle MF, Choubrac P, Drosdowsky MA, Jacot P: Valour semilogique du trauxde l'haptoglobine et du seromucoide dans les affections coronariennes. *Presse Med* **76**: 1805, 1968
8. Agostoni A, Vergani C, Stabilini R, Marsini B, Arcidiacono R, Binaghi PC: Immunochemical quantitation of acute phase reactive proteins in M.I. *Am Heart J* **80**: 313, 1970
9. Bisariya BN, Vasavada PS, Mukerjee DP: Serum haptoglobin in coronary artery disease. *Indian Heart J* **22**: 246, 1970
10. Owen JA, Better FC, Hoban J: A simple method for the determination of serum haptoglobin. *J. Clin Path* **13**: 163, 1960
11. Davis BJ: Disc electrophoresis by polyacrylamide gel. *Annals NY Acad Sci* **121**: 404, 1964
12. Bachmann GW, Weiss ME, Rapp W: Differenziette quantitative serum eiweissbestimmung in ablauf des herzinfarktes. *Schweiz Med Wschr* **98**: 1825, 1968
13. Agostoni A, Binaghi C, Radice F, Stabilini R: Acute phase protein and healing of M.I. *J Mol Cell Cardiol* **4**: 519, 1972
14. Friedberg CK: Coronary heart disease. Other diseases of coronary artery. *in Diseases of Heart*, WB Saunders Co Ltd, London, p645, 1966
15. Jayle MF, Coumel H: Les modifications dela formule proteique du serum dans l'infarctus du myocarde. *Arch Mal Coeur et Vaisseaux* **4**: 328, 1952
16. Genda A: Studies on atherosclerosis with reference to acid mucopolysaccharides. *Jap Circulat J* **30**: 560, 1966
17. Sanwald R, Ritz E, Hugh B: Research on mucopolysaccharides in normal and atherosclerotic arteries. *J Atherosclerosis Res* **8**: 433, 1968