



A COMPARITIVE STUDY OF SERUM LACTATE DEHYDROGENASE ENZYME AS AN EARLY BIOMARKER IN ORAL SUBMUCOUS FIBROSIS AND ORAL SQUAMOUS CELL CARCINOMA

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ABSTRACT

Oral diseases and conditions have a broad impact on health and well being of an individual. Aim of this study was 'To evaluate the level of serum lactate dehydrogenase as a potential biomarker for the diagnosis of oral cancer and oral submucous fibrosis'. The present study include 150 subjects of either sex among them:- Group a- 50 healthy control without any clinical symptoms or disease, Group b- 50 Oral submucous fibrosis patients and Group c- 50 Oral squamous cell carcinoma patients. Highly significant increase serum lactate dehydrogenase enzyme leve was found in Oral submucous fibrosis and oral squamous cell carcinoma as compared to healthy control. Serum LDH level of OSMF patients shows significant difference with serum LDH level of OSCC Patients. Mean Serum LDH level is higher in OSCC patients.

KEYWORDS :

INTRODUCTION

Oral diseases and conditions have a broad impact on health and well being of an individual. Since time immemorial, the teeth, the mouth and the face have held a seemingly interesting fascination for mankind.¹ The mouth is the gateway to many diseases. Dental and medical practitioners encounter a wide spectrum of oral mucosal lesions in their day to day clinical practice. Oral mucous membrane is a unique area of the body, which is continuously exposed to various kinds of stresses such as heat, cold, microorganism, chemicals and mechanical irritation. In response to these stresses both epithelium and connective tissue layers of the oral mucosa exhibit acute and chronic reactive changes.

Oral submucous fibrosis is a chronic, complex, premalignant (1% transformation risk) lesion affecting any part of the oral cavity and sometime the pharynx. characterized by juxta-epithelial inflammatory reaction and progressive fibrosis of the submucosal tissues (the lamina propria and deeper connective tissue). As the disease progresses, the jaws become rigid to the point that the person is unable to open the mouth. (Pindborg JJ and Sirsat S.M. 1966).

Oral squamous cell carcinoma (OSCC) is the sixth most common human cancer affecting the oral cavity that encompasses at least 90% of all malignancy and is an important cause for cancer morbidity and mortality worldwide.²

Tumor markers in serum, tissue and other body fluids during neoplastic process are of clinical value in the management of patients with various body cancers. Among all the body fluids, blood has been the media of choice for the study of the biochemical markers by the medical community but it does have some inherent disadvantages.³ Despite the absence of charisma, however, a growing number of researchers are finding that saliva provides an easily available, non-invasive diagnostic medium for rapidly widening range of disease and clinical situations.⁴

The enzyme lactate dehydrogenase (LDH) is found in the cells of almost all the tissues. Increased serum LDH activity is considered as a marker of cellular necrosis and serum LDH levels have been used as a biochemical marker in diagnosis in various cancers like oral, laryngeal and breast cancer. LDH activity is mainly due to genomic changes during malignant transformation. Increased LDH levels are due to increased mitotic index and more lactic acid production by tumor cells due to breakdown of glycoprotein.⁴

Many methods are available today for diagnosis of cancers but more emphasis is always given to a noninvasive and an accurate test for diagnosis, thus the saliva an important and potential biomarker can

be used as an adjunctive step for diagnosing oral cancer and precancers which improve the prognosis and outcome of the disease process.

AIM OF STUDY: To evaluate the level of serum lactate dehydrogenase as a potential biomarker for the diagnosis of oral cancer and oral submucous fibrosis.

MATERIAL AND METHOD

This study was designed to evaluate a comparative study of serum lactate dehydrogenase enzyme level in patients with Oral submucous fibrosis, Oral squamous cell carcinoma and healthy control.

The present study include 150 subjects of either sex among them:-

- Group a)- 50 healthy control without any clinical symptoms or disease
- Group b)- 50 Oral submucous fibrosis patients and
- Group c)- 50 Oral squamous cell carcinoma patients

study design :-

Present study was conducted in the Department of Biochemistry, Jhalawar Medical college. The subjects in our study groups were selected from O.P.D. of Department of Dental of S.R.G. Hospital.

Subject selection:-

Based on the following inclusion and exclusion criteria selection of subjects for the study was made on the basis of detailed history and proper clinical examination.

Inclusion criteria:-

Patient's willingness to participate.
Subjects in the age group of 20-80 years irrespective of sex.
Histopathologically diagnosed patients of OSCC and OSMF.

Exclusion criteria:-

- Patient not willing for participation in the study.
- Patients undergoing chemotherapy, radiotherapy or any surgical procedure for OSCC.
- Patients with a history of heart failure (myocardial infarction) within past 2 weeks.
- Patient taking procainamides and other drugs used to treat arrhythmia, pulmonary infarction and stroke
- Patients with history of consumption of aspirin, narcotics or alcohol, and recent anaesthesia.

Sample collection:

Serum sample

Five milliliters of blood was drawn from the peripheral veins under

aseptic conditions. Collected blood sample was kept in test tubes at room temperature for 30-60 minutes to allow sedimentation for cellular fraction of blood. The sedimented blood sample was centrifuged at 3000 rpm for 10-15 minutes. Supernatant serum separated out with the help of micropipette. Then the sample was analysed by fully autoanalyser by modified IFCC method

Lactate Dehydrogenase Test :- Lactate dehydrogenase, also called lactic dehydrogenase, or LDH, is an enzyme found in the cells of many body tissues, including the heart, liver, kidneys, skeletal muscle, brain, red blood cells, and lungs. It is responsible for converting muscle lactic acid into pyruvic acid, an essential step in producing cellular energy.

"Lactate dehydrogenase (LDH) is an enzyme present in a wide variety of organisms, including plants and animals". Its Enzyme Commission number is EC 1.1.1.27 where;

- EC 1 = oxidoreductase
- EC 1.1 = acting on the CH-OH group of the donor
- EC 1.1.1 = With NAD or NADP as acceptor
- EC 1.1.1.27 = L-lactate dehydrogenase

Thus, it is an oxidoreductase enzyme that catalyzes the interconversion of pyruvate and lactate accompanied by the interconversion of NADH and NAD+ (Butova, O.A. & Masalov, S.V. et al., 2009) The reaction is as following:

During anaerobic glycolysis (limited or no oxygen during intense muscular activity), the enzyme converts pyruvate to lactate.

OBSERVATION

Table:1 Comparison of LDH among Healthy Control, OSMF Patient and OSCC Patient

Groups	N	Mean	Std. Deviation	F value	P value
Healthy Control	50	164.2400	34.86157	146.325	<0.0001*
OSMF Patient	50	244.9200	52.24543		
OSCC Patient	50	328.6000	54.58040		

Table:2 Comparison of LDH between Healthy Control and OSMF Patient.

Group	Mean	SD	T value	P value
Healthy	164.2400	34.86157	9.0831	<0.0001
OSMF Patient	244.9200	52.24543		

Table:3 Comparison of LDH between Healthy Control and OSCC Patient

Group	Mean	SD	T value	P value
Healthy	164.2400	34.86157	17.9452	<0.0001
OSCC Patient	328.6000	54.58040		

RESULT

The present study was conducted on total number of 150 subjects, out of which 50 were Oral submucous fibrosis, 50 were Oral squamous cell carcinoma and 50 were the healthy control. Oral submucous fibrosis and Oral squamous cell carcinoma patients were studied with reference to age group and gender group. Level of serum Lactate dehydrogenase enzyme were determined in Oral submucous fibrosis and Oral squamous cell carcinoma patients and healthy control. The values thus obtained were subjected to statistical analysis was done by help of SPSS 20.0 Software. The data in this study was expressed as mean ± SD, p<0.05 was considered as statistically significant. The present study was a comparative and case control study.

Table:1 show that Distribution of Serum LDH according to Groups the mean value of healthy control was 164.24 and Standard deviation was 34.86. In OSMF patients mean value of serum LDH was 244.92 and SD was 52.24. OSCC patients show mean value of serum LDH was 328.60 with SD of 54.58, difference of mean value of LDH

was statistically significant. Table:2 show that the mean±SD LDH value of healthy control was 164.24±34.86 and mean±SD LDH value of OSMF patients was 244.92 ± 52.24. There was statistically significant difference between healthy control and OSMF LDH level (p<0.0001)

Table:3 show that the mean±SD LDH value of healthy control was 164.24±34.86 and mean±SD LDH value of OSCC patients was 328.60±54.58. There was statistically significant difference between healthy control and OSMF LDH level (p<0.0001*)

DISCUSSION

Oral submucous fibrosis and Oral squamous cell carcinoma patients exhibited increased levels of serum and salivary Lactate dehydrogenase enzyme. The present study was conducted with the aim to measure and compare LDH levels in serum of patients with Oral submucous fibrosis and oral squamous cell carcinoma.

According to M. Sivaramakrishnan, B. Sivapathasundharam, M. Jananni (2014) the average salivary LDH value OSMF patient was 606.83 ± 60.09 U/l and for healthy subjects was 80.73 ± 20.06 U/l. They also stated that theirs was the first study in which the total LDH levels in serum and saliva of the OSMF cases were estimated.

Lactate dehydrogenase is a hydrogen transfer enzyme and is involved in the final step in the metabolic chain of anaerobic glycolysis. LDH catalyses the oxidation of L-lactate to pyruvate with nicotinamide-adenine dinucleotide (NAD) + as hydrogen acceptor. The extracellular appearance of LDH is used to detect cell damage or cell death. Due to its extraordinarily widespread distribution in the body, serum LDH is abnormal in a host of disorders. It is released into the peripheral blood after cell death caused by, e.g. ischemia, excess heat or cold, starvation, dehydration, injury, exposure to bacterial toxins, after ingestion of certain drugs, and from chemical poisonings.⁵

Different studies observed that there was a significant correlation between the degree of differentiation of Oral squamous cell carcinoma and serum LDH.⁶

SUMMARY AND CONCLUSION

This study was designed to evaluate serum Lactate dehydrogenase enzyme as an early biomarker in Oral submucous fibrosis and Oral squamous cell carcinoma. This study include 150 patients of both sex ranging 30-80 year among them 50 normal healthy controls without any clinical symptoms or disease and 50 Oral submucous fibrosis, 50 Oral squamous cell carcinoma patients.

Highly significant increase serum lactate dehydrogenase enzyme level was found in Oral submucous fibrosis and oral squamous cell carcinoma as compared to healthy control.

Serum LDH level of OSMF patients shows significant difference with serum LDH level of OSCC Patients. Mean Serum LDH level is higher in OSCC patients.

Thus it can be concluded that serum lactate dehydrogenase is an early biomarker and supportive diagnostic tool in oral submucous fibrosis and oral squamous cell carcinoma.

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