

# The effect of parotid gland examination and massage on serum amylase levels in patients with acute parotitis

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## Abstract

**Objective:** Acute infection of the parotid gland is common in the clinical practice of ear-nose-throat medicine. The present study aims to demonstrate the effect of parotid gland massage on serum amylase levels.

**Methods:** The study included 30 patients with acute parotitis presenting to our clinic and 14 healthy volunteers. The correlation between the serum samples collected before and after parotid gland massage was compared.

**Results:** A significant difference was observed in the amylase levels before and after massage in the acute parotitis group. Amylase levels did not differ significantly between measurements before and after massage in healthy subjects.

**Conclusion:** Patients should be evaluated with consideration to the effect of parotid gland massage performed to determine suppuration of parotid gland on amylase levels.

**Keywords:** Amylase, parotid gland, acute parotitis, parotid massage.

## Özet: Akut parotit hastalarında parotis muayenesi ve masajın serum amilaz düzeylerine etkisi

**Amaç:** Kulak-burun-boğaz tıbbi klinik uygulamasında akut parotit bezi enfeksiyonu sık görülmektedir. Bu çalışma parotiz bezi masajının serum amilaz düzeylerine etkisini göstermeyi amaçlamaktadır.

**Yöntem:** Çalışma kliniğimize başvurmuş 30 akut parotit hastasını ve 14 sağlıklı gönüllüyü içermektedir. Parotis masajı öncesi ve sonrası toplanan serum örnekleri arasındaki korelasyon karşılaştırıldı.

**Bulgular:** Akut parotis grubunda masaj öncesi ve sonrası amilaz düzeyleri arasında anlamlı bir fark gözlenmiştir. Sağlıklı kişilerde ise masaj öncesi ve sonrası ölçümler birbirlerinden anlamlı derecede farklı değildi.

**Sonuç:** Parotis bezi süpürasyonunun amilaz düzeylerine etkisini belirlemek için uygulanmış parotis bezi masajının etkisi açısından hastaların değerlendirilmeleri gerekir.

**Anahtar sözcükler:** Amilaz, parotid bezi, akut parotit, parotis masajı.

Parotid gland is one of the major salivary glands, releasing 25–30% of saliva and 80% of amylase. In ear-nose-throat (ENT) practice, where parotid gland pathologies are suspected, parotid massage is performed in cases of parotid grand palpation, Stensen's duct inspection on the oral cavity and saliva secretion to observe suppuration. Examining sensitivity with palpation helps to understand if there are any masses within the parotid gland, if the mass is painful, if there is edema or saliva secretion from the Stensen's duct, and serous or purulent character of the secretion guides diagnosis.

Salivary amylase represents basically 10–20% of all proteins synthesized from the parotid gland and produced in salivary glands. Amylase inhibits both growth of some microbiological agents and their adhesion to intact tissue. Amylase is also used in diagnosis since it is a specific enzyme released by salivary glands.

Serum amylase levels may be elevated in conditions that affect salivary glands such as acute and chronic pancreatitis, perforated peptic ulcer, ectopic pregnancy rupture, pancreatic cyst, parotitis and mumps, but may also be found at increased levels in many other disorders including fluid bal-

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ance disorders, cerebrovascular disease, respiratory and cardiac disorders, hepatobiliary disorders, diabetes mellitus, peptic ulcer, renal-ovarian-gastrointestinal system malignancies, intra- and extra-abdominal surgeries, trauma, dyslipidemia, pheochromocytoma, multiple myeloma, organ transplantations, infections, ethnic hyperamylasemia, chronic pancreatic non-pathological hyperamylasemia and familial hyperamylasemia.<sup>[1]</sup> Several medicinal products can also lead to elevations in pancreatitis and amylase levels. Hyperamylasemia may develop in cases of reduced metabolic clearance of amylase such as macroamylasemia or renal failure without pancreatic and/or salivary gland involvement.<sup>[2-4]</sup>

Amylase levels secreted from salivary glands in response to neurotransmitter stimulation of salivary glands with either sympathetic or parasympathetic innervation indicate sympathetic activity.

In acute parotitis, serum amylase values usually guide diagnosis. It is common practice to look at amylase levels following a physical examination in patients who present with swelling of the parotid gland, pain and similar pathologies and for whom acute infection is suspected. Thus, amylase levels have to be measured after the parotid gland has been massaged. This may misguide the clinician if the massage alters amylase values in patients with or without parotid pathology. In our study, we intend to compare amylase levels before and after parotid massage to conclude whether this is the case or not.

## Materials and Methods

Our study included patients who presented to our clinic with acute parotitis that had an onset within a few days and healthy volunteers with no complaints. The patients and volunteers were provided with information about the study. Their informed consents were obtained. For the study, the approval was received from Istanbul Medipol University's ethics board for clinical trials. Forty-four subjects were enrolled in the study. This included 30 patients diagnosed with acute parotitis at the ENT outpatient clinic of the Medical Faculty of Istanbul Medipol University. Fourteen individuals with no medical conditions involving the parotid gland at the same period were included as controls. For both groups, serum samples were collected before parotid massage and serum amylase and lipase levels were measured to be compared for pancreatic disorders. Parotid massage was performed afterwards and serum amylase and lipase levels were measured again. For serum amylase determinations in serum samples, Beckman amylase kit on Beckman

Coulter analyzer was used and the results were reported after performing relevant analyses. For plasma lipase determinations from the same serum samples, Dade Behring lipase kit on XPand analyzer was used and similarly, the results were reported after performing the required analyses. Patients with history of salivary gland disorders, patients with existing acute or chronic pancreatitis, those taking medicinal product(s) that affect amylase levels (acetyl salicylic acid, thiazide, corticosteroids, asparaginase, azathioprine, cyproheptadine, narcotic analgesics, oral contraceptives, rifampin, sulfasalazine), those with chronic conditions, malignancies, those with prior radiotherapy and those with conditions that affect salivary secretion such as dehydration and malnutrition were excluded from the study.

## Statistical analysis

Data were analyzed using "Statistical Package for Social Sciences" software (SPSS for Windows 15.0; SPSS Inc., Chicago, IL, USA). Values for continuous variables were given either as mean  $\pm$  standard deviation or as median, based on the normality of distribution. Student's t-test was used in the comparison of normal and homogeneous distribution of the parametric values. Chi-square and Mann-Whitney U test were used to compare non-parametric values. Student's t-test and Wilcoxon test were used in the comparison of dependent variables for parametric data in dependent samples and for non-parametric data, respectively. Statistical significance was set at  $p < 0.05$ .

## Results

Of the patients, 22 (73.3%) were females and 8 (26.7%) were males and their mean age was  $27.9 \pm 13.3$  (range: 14-42) years. In the control group, 10 (71.4%) were females and 4 (28.6%) were males, with a mean age of  $30.3 \pm 14.2$  years. Patient and control groups did not differ significantly by age or gender ( $p = 0.651$  and  $p = 0.632$ , respectively).

Amylase levels before massage were elevated in all patients with parotitis while lipase levels were normal. Patients' mean amylase level before massage was  $409.8 \pm 163.1$  (range: 101-643) U/L but mean amylase level after massage was  $487.1 \pm 214.4$  (range: 144-886) U/L. Amylase levels were increased in all patients. Mean increase was  $77.3 \pm 87.5$  (range: 13-289) U/L. The increase between the two measurements was significant ( $p < 0.001$ ). In the control group, mean amylase level before massage was  $70.3 \pm 6.6$  (range: 60-78) U/L while it was  $66.0 \pm 6.4$  (range: 57-73) U/L after massage. Amylase levels were increased in only 2 (14.3%) of the controls. Mean change was  $-4.3 \pm 7.2$  (range: -14-8) U/L. The difference between

the two measurements was not statistically significant ( $p=0.128$ ) (Table 1).

Patients' mean lipase level before massage was  $29.8\pm 8.3$  (range: 19–45) U/L and mean amylase level was  $28.0\pm 7.0$  (range: 19–42) U/L after massage. Lipase levels increased in 12 patients. Mean change was  $-1.3\pm 4.3$  (range: -12–3) U/L. The increase between the two measurements was not statistically significant ( $p=0.201$ ). In the control group, mean lipase level before massage was  $30.7\pm 4.8$  (range: 23–35) U/L and  $31.0\pm 6.8$  (range: 23–43) U/L after massage. Lipase levels increased in only 4 (24.6%) of the controls. Mean change was  $0.3\pm 8.1$  (range: -12–13) U/L. The difference between the two measurements was not statistically significant ( $p=0.917$ ) (Table 1).

## Discussion

Serum amylase levels are used in the diagnosis of salivary gland and pancreas disorders but it is released from many tissues including the ovaries, testes and striated muscle. Changes in serum amylase levels are observed in many conditions.<sup>[5]</sup>

The effect of parotid gland palpation on serum amylase levels is not well known according to the literature.

Ericson et al. found no difference in alpha-amylase levels when they compared children with recurring parotitis and normal children in their study.<sup>[6]</sup>

It is certain that rectal-digital examination and sonographic probe application affect on serum prostate-specific antigen.<sup>[7,8]</sup> Likewise, routine parotid gland massage may increase serum amylase levels. So we wanted to investigate the potential effect of parotid gland massage on serum amylase levels. During the half-life period of amylase, we can observe the alterations of serum amylase levels after examination, message or any manipulations. There are two groups in our study: the first group we investigated consists of patients with parotitis and the second group consists of healthy people. In the first group, serum amylase level was significantly higher when measured after massage compared to before massage. Serum lipase levels were not altered significantly in the first group. In the second group, the difference between serum amylase or lipase levels was not statistically significant before and after massage. This study demonstrated that routine parotid gland massage results in increased serum amylase levels in patients with acute parotitis. Based on our results, parotid gland massage may cause a transient increase in serum amylase levels. The false amylase value may lead to inac-

**Table 1.** Comparison of serum amylase and lipase levels of patients and healthy volunteers before and after massage.

		Patients (n=30) Mean±SD (U/L)	Controls (n=14) Mean±SD (U/L)
Mean serum amylase	Before massage	409.8±163.1	70.3±6.6
	After massage	487.1±214.4	66.0±6.4
p		<0.001	0.128
Mean serum lipase	Before massage	29.8±8.3	30.7±4.8
	After massage	28.0±7.0	31.0±6.8
p		0.201	0.917

SD: standard deviation

curate diagnosis and treatment. Therefore, measuring serum amylase levels before any manipulation will lead to more accurate results.

Toros et al. studied the effect of routine palpation of the thyroid gland on thyroid gland and found statistically significantly higher values for total T3, free T3, free T4 and thyroglobulin in patients who received thyroid palpation compared to those who did not receive palpation. This study indicated that thyroid palpation may lead to a transient increase, though within normal ranges, in total circulating levels of T3, free T3, free T4 and thyroglobulin.<sup>[9]</sup>

A study by Lever et al. demonstrated that surgical palpation and fine needle aspiration but not external manual palpation increased serum thyroglobulin levels.<sup>[10]</sup> In a similar study, Luboshitzky et al. demonstrated increased serum levels of thyroglobulin in 4 of the 25 patients who were given thyroid palpation and fine needle aspiration.<sup>[11]</sup>

There are no studies on the effect of parotid gland massage on serum amylase levels. Based on the results of our study, parotid gland massage does not alter serum amylase levels in patients without parotid gland pathology but results in increased levels in patients with acute parotitis.

## Conclusion

Parotid gland examination and massage do not alter serum amylase measurements in individuals without any parotid gland pathology. In patients with acute parotitis, however, parotid gland massage results in a significant increase in serum amylase levels. Evaluating serum amylase levels before any manipulation will lead to more accurate values and will avoid inaccurate diagnosis and treatment.

**Conflict of Interest:** No conflicts declared.

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