

Presence of Cheek Dimples and Absence of Palmaris Longus - An Anatomical Correlation from Dakshina Kannada, Karnataka

Praveen Mulky Shenoy¹, Amith Ramos², Bharath Shetty³, Aravind Pallipady⁴

¹Department of Anatomy, Srinivas Institute of Medical Sciences, Mangalore, Karnataka, India. ²Department of Anatomy, K.S. Hegde Medical Academy, Mangalore, Karnataka, India. ³Department of Forensic Medicine, K.V.G. Medical College and Hospital, Sullia, Dakshina Kannada, Karnataka, India. ⁴Department of Pathology, A.J. Institute of Medical Sciences and Research Centre, Mangalore, Karnataka, India.

ABSTRACT

BACKGROUND

Palmaris longus (PL) tendon agenesis varies from 5 % to 30 % in different ethnic groups worldwide. Its agenesis is associated with decreased wrist grip, pinch grip, presence of cheek dimples, difference of prevalence of agenesis with gender and handedness and with flexor carpi superficialis tendon. Student and general population surveys done in previous studies shows the association between these variables. The purpose of this study was to find out the association between the presence of cheek dimples with absence of palmaris long tendon.

METHODS

We examined 1200 medical and allied health students (600 males, 600 females) aged 18 - 24 years to assess the incidence of palmaris longus absence and the presence of cheek and chin dimples. The presence or absence of palmaris longus was assessed by clinical inspection using standard tests. The effectiveness of these 'standard tests' is also tested along with wrist strength and pinch strength.

RESULTS

163 students had PL agenesis. One hundred and twenty-one subjects had unilateral absence of palmaris longus (13.5 %). The tendon was absent bilaterally in 42 subjects (3.5) 77 students had either unilateral or bilateral cheek dimples out of 163 PL agenesis. The Mishra's test is found to be most effective for properly defining the PL at wrist.

CONCLUSIONS

Prevalence of absence of palmaris longus is around 13.5 %. Unilateral agenesis of PL is 10 %. Absence of palmaris longus has strong association to presence of cheek dimples. Up to 45 % of PL agenesis will show either unilateral or bilateral cheek dimples. Studies on cheek dimples, panniculus carnosus are very scanty in literature; more studies might reveal interesting correlation. The grip strength of the wrist is unaffected due to palmaris longus agenesis; however, the pinch grip of 4th finger with thumb appears to be certainly decreased. Mishra's test proves to be the best in demonstrating the PL. A radiant smile displaying the cheek dimples, has 50 % possibility of absence of PL.

KEYWORDS

Palmaris Longus Agenesis, Cheek Dimples, Bifid Zygomaticus Major, Panniculus Carnosus, Chin Dimples

Corresponding Author:

*Dr. Amith Ramos,
Associate Professor,
Department of Anatomy,
K.S. Hegde Medical Academy,
Mangalore, Karnataka, India.
E-mail: amith_amos@hotmail.com*

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BACKGROUND

Palmaris longus muscle is a superficial, slender, fusiform muscle of the forearm acting as a weak wrist flexor in tandem with the other forearm flexor muscles. The proximal fleshy origin attachment is on the medial epicondyle, adjoining muscles, intermuscular septa and ante brachial fascia in common with the other superficial flexors. Distally, a long tendon starts in the mid forearm and is inserted into the distal part of the flexor retinaculum and the palmar aponeurosis. It lies between the flexor carpi radialis and flexor carpi ulnaris and overlying the median nerve. In evolutionary history, it is seen to be prominent in mammals that use their forelimbs for ambulation and a well-developed muscle is seen in the orangutan but is vestigial in humans.

Palmaris muscle agenesis is well documented. Its agenesis ranges from 10 to 20 % among different ethnic groups.^{1,2} It is the tendon of the muscle commonly used for grafting.³ The absence of PL is associated with presence of cheek dimples.⁴ The PL can be easily tested by Schaeffer's test, Mishra's test 1 and 2 and Thompson's test or Pushpa Kumar's test, to find out the agenesis.⁵ Numerous variations have been reported in both morphology and number.

It may have a proximal tendon or a distal tendon, or have a fleshy central belly with proximal and distal tendons, it maybe digastric or fleshy throughout or its tendon may be split and sometimes it maybe degenerated to such an extent it that may be simply represented by a tendinous band or reversed palmaris longus and its variations has clinical and surgical relevance.⁶ Some studies have revealed its absence is more in right side and high in right hand dominance, agenesis of PL is in proportionate with the hand dominance.⁷ Some studies have shown agenesis to be more in males than in females and vice versa in few others, PL agenesis is related to the gender.⁸

Few studies have shown the PL agenesis is associated with flexor digitorum superficialis deformity or absence on its medial half, there by contributing to the fact that the pinch grip is decreased in little and ring fingers when approximated to that with the thumb; there is no link between absence of flexor digitorum superficialis to little finger and PL agenesis.⁹ Few studies have shown the difference of pinch grip strength in males and females; there is no difference in grip strength in both sexes but the pinch strength is affected with 4th and 5th fingers.¹⁰

Zygomaticus is termed 'muscle for smile'. Its bifid condition found in dissection, is confirmed to be responsible for the cheek dimples; Cheek dimples are caused usually due to bifid zygomaticus major (ZMj).¹¹

Some malunited fractures or underlying pathology may cause skin dimples. Skin dimples other than cheek and chin may indicate the underlying significant etiology.¹² Few studies have shown the high incidence of bifid ZMj; ZMj is bifid in as many as 40 % of cadaveric dissections.¹³ Whereas other studies limit the variant around 20 %.; Bifid ZMj prevalence varies according to the population worldwide, an average being 22 %.¹⁴

Though the prevalence of studies done to know the presence of cheek dimples in population is scanty, one study

done in Sullia taluk, Karnataka, India aggregates it around 10 %. Presence of cheek dimples in population is around 10 %., unilateral is more than the bilateral occurrence.¹⁵

Another remnant of panniculus carnosus is the mentalis muscle, present around chin area. Chin dimples is caused by the bifid mentalis muscle.¹⁶ it was interesting to note that association of cheek dimples with absence PL as described in Darwin's beautiful words, the cutaneous panniculus carnosus muscle has long been considered a vestigial and 'absolutely useless' organ in humans; a remnant of evolution. This, together with interindividual variability may be the reason why it remains relatively ill-studied and underappreciated, in stark comparison with other muscles of the body. PL and ZMj both are remnants of panniculus carnosus.¹⁷

Objectives

Our aim is to find out the association between the presence of cheek dimples with absence of palmaris long tendon in our study group of students.

Our objectives are also to find out palmaris longus agenesis percentage and comparing with other studies done. Its agenesis associated with handedness of individuals will be noted. The association between PL agenesis and flexor digitorum superficialis agenesis will be noted. The association between absence of PL and the presence of chin dimples will also be noted. The prevalence of cheek dimples in the study group will be assessed.

The presence of bifid zygomaticus major and its association with absence palmaris longus will be noted through the cadaveric dissection. We intend to find out all these parameters related to agenesis by conducting a student population survey and comparing with the similar studies done.

METHODS

It is a cross sectional observational study done over a year, from March 2020 to March 2021, taking the student population from three medical colleges. We surveyed 1200 students, 600 males and 600 females, to compare and contrast the prevalence of absence of palmaris longus and the presence of cheek and chin dimples. The study was conducted in 3 medical colleges in association. The written information consent was taken from the participants, after obtaining the ethical clearance from the institutions. We also measured the grip of the fist and pinching sensation using little and ring fingers with the thumb. We correlated the absence with hand dominance. The palmaris longus is tested with Schaeffer's test, Mishra's test 1 and 2 and Thompson's test or Pushpa Kumar's test. All the tests were performed in every individual to know the accuracy of the tests.

The findings were recorded and compared with the similar studies done. We performed all of the five tests to clearly demonstrate the PL tendon at the wrist in both wrists. The cheek dimples were noted at rest and on attempting to smile or with 'radiant smile'. Chin dimples were also noted in

the similar way. The family history of presence of cheek or chin dimples were taken. We dissected the face of 5 formalin-soaked cadavers where PL was found to be absent, to note the bifid ZMj. The dissection was carried out as per the cunning ham dissection manual, in the medical college dissection halls. A median incision from root of the nose to the point of chin was made. A horizontal incision from angle of mouth to the posterior border of mandible was made. Lowe flap is reflected towards the lower border of mandible and upper flap is reflected towards auricle. The bifid occurrence is photographed. The naturally occurring dimples were counted. All the findings were recorded, documented, tabulated, and analysed with the similar studies done.

Inclusion Criteria

All the clean-shaven boys and girls who gave the consent were included in the study.

Exclusion Criteria

Boys with spotted beard were excluded. The anatomical visible gross relevant disability, morbidity or any other associated skeletal, muscular disorder conditions were ruled out of the study. Any student with surgical intervention on face was ruled out of the study.

Descriptions of the Tests Done

Thompson’s Test

The subjects were asked to make a fist and flex the wrist. The thumb was kept opposed and flexed over the fingers.

Mishra’s Test I

The subjects were asked to flex the wrist, while the examiner passively hyperextended the metacarpophalangeal joints of all the fingers.

Mishra’s Test II

The subjects were asked to abduct the thumb against resistance with the wrist in slight palmar flexion.

Pushpa Kumar’s Test

This is a two-finger test where the subject is asked to fully extent the index and middle finger, keeping the wrist and all the other fingers flexed. The thumb is kept fully opposed and flexed.

Schaeffer Test

Students are asked to touch the pads of the thumb and little finger together while flexing the wrist, and if present, the tendon of palmaris longus should protrude anteriorly at the wrist joint.

Statistical Analysis

The statistical analysis done using statistical package for social sciences (SPSS) software and results plotted using MS software pie chart format.

RESULTS



Figure 1.
Bifid Zygomaticus Major in the Cadaver with Palmaris Longus Agenesis

Sex	PL Absent	Unilateral Absent PL	Bilateral Absent	Unilateral Absent(rt)	Unilateral Absent(lt)	Cheek Dimples	Unilateral Dimples	Bilateral Dimples
Males	92	65	27	40	25	45	6	39
Females	71	56	15	50	06	32	8	24
Both	163	121	42	90	31	77	14	63
Percentage	13.5%	10%	3.5%	7.5	2.5	6.4	1.2	5.2

Table 1. The Incidence of PL Agenesis and Prevalence of Cheek Dimples

	Wrist Grip (Normal)	Pinch (4 th), Decreased	Pinch (5 th) Decreased	Dominance (rt)	Dominance (lt)	Dimple at Rest	Dimple upon 'Smile'
Males	92 (100 %)	73	44	90	2	5	40
Females	71 (100 %)	64	28	69	2	10	22
Both	163 (100 %)	137	72	159	4	15	62

Table 2. Wrist Grip and Hand Grips Associated with PL Agenesis

Test Performed	Males	Females	Both	Percentage
Thompson’s test	15	12	37	22
Mishra’s Test I	22	17	39	24
Mishra’s Test II	21	17	38	24
Pushpa Kumar’s Test:	4	4	08	5
Schaeffer test	30	21	51	25

Table 3. Combined Mishra’s Test is Most Useful in Demonstrating the PL

The overall absence of PL is 13.5 %, slightly more seen in males than in females. Unilateral absence is 10 % and bilateral absence is 3.5 %. Unilateral absence is more seen in right dominant hand. However, there is no relation to the fist drip noted in both sexes. The pinch strength found to be decreased with approximation of tips of little and ring fingers to the thumb. The pinch strength is more decreased with ring finger than with the little finger. Nearly 45 % subjects with agenesis of palmaris longus either had unilateral or bilateral cheek dimples. We countered four chin dimples, all males and associated with bilateral agenesis of PL in two and unilateral agenesis in two. All four had unilateral cheek dimples as well.

The combined Mishra's tests were most useful in accurate visual of palmaris longus. Fig one shows the bifid zygomaticus major in the cadaveric face dissection. In all the 5 specimens dissected, there found to be no relation of flexor digitorum superficialis muscle agenesis or variation in its morphology. The percentage and variations of results are tabulated as 1, 2, and 3. Among the participants in study, 59 others had chin or cheek dimples but didn't show the absence of PL. This may account that the incidence of cheek dimples is around 10 %. Out of 136 participants who had cheek dimples, 71 said their one or both parents were having either unilateral or bilateral cheek or chin dimples.

DISCUSSION

PL muscle is most extensively studied for its agenesis, clinical importance, variation in morphology worldwide.^{1,2} The tendon of PL is widely used for grafting as in deformed digit in leprosy, tendon transfer in extensor other flexor tendon injuries or in ptosis.³ The study done by Anuradha et al.⁴ shows that the absence of PL is related to presence of cheek dimples, unilateral or bilateral or vice versa. Our study is in agreement with this study. The PL can be easily tested by Schaeffer's test, Mishra's test 1 and 2 and Thompson's test or Pushpa Kumar's test, to find out the agenesis.⁵ These are simple tests which can be made to do by individuals assembled in a group of five to ten, demonstrating it to them first and assessing the prominent tendon of PL. Sometimes the palmaris tendon may get inserted as fleshy belly at the wrist and may compress the structures, and may not be visible through the tests mandated.⁶

Our study its clearly shows that the first grip is not affected due to absence of PL. Contradicting study by Erić M et al.⁷ this is due to the fact that PL is weak flexor, and naturally a generating tendon as it is classified into remnants of panniculus carnosus. Our study shows the prevalence of absence of PL is more in males, and is marginally associated with difference in gender, agrees with Yong MW.⁸ Our study is in agreement with Cetin A et al.¹⁰ demonstrated the pinch grip, which is approximating the pulps of little finger and ring finger with that of thumb, the unilateral absence found out that the grip is markedly decreased at the affected site than the non-affected side. In bilateral agenesis, the grip is also decreased when compared to the other fingers pinching action with thumb in similar fashion. We kept an examiner's finger in between to assess the same, it's the 4th finger that is markedly reduced compared to the 5th grip.

Along with risorius the bifid zygomaticus major is responsible for cheek dimples, the rationale behind the cosmetic surgery performed in order to create the artificial dimples. The zygomaticus major runs from zygomatic bone to the side of the mouth, though its bifid incidence is reported around 22 % worldwide the prevalence of cheek dimples stands at around 10 %. We found the bifid ZMj in three specimens dissected out of five palmaris longus co associated agenesis. Further studies are mandatory to compare the agenesis to that of prevalence of bifid ZMj.¹¹ Cheek, chin, sacral skin dimples are taken as naturally occurring. But other skin dimples other than the ones

mentioned, show some or other underlying pathology or aetiology of pathology.¹² Presence of cheek dimples makes the face look more beautiful or handsome, the reason behind high demand for plastic surgery for the same. Not much scientific studies are done on the same to find out the prevalence and call for the same must be turned on. We boast on high end research and mourn when we don't get the simple figure or statistics of simple things affecting the population. More studies on cheek and chin dimples is mandated as done by Chalathadka M.¹⁵

In our study, 59 participants who had chin or cheek dimples, unilateral or bilateral didn't had the agenesis of PL. These statistics agree with Chalathadka M in aggregating the prevalence of skin dimples on face is around 10 %. Mentalis muscle is another teeny tiny muscle in the midline below the lower lip that originates from mandible and is inserted into the skin. This also, apart from panniculus carnosus and bifid mentalis is mostly responsible for having chin dimples.

Similar study done by Agarwal P et al.¹⁸ shows that the unilateral absence of PL is 14 % and bilateral is 3.5 %. Our study is in total agreement with this. While study done in Turkey showed the high incidence of bilateral absence of PL, and the best method used to assess PL is Mishra's test, our study is in agreement with this in its later half.¹⁹ Further, 71 out of 136 participants who presented with cheek or chin dimples gave the family history of facial dimples. Their one or either of the parents had either unilateral or bilateral cheek or chin dimples. The study done by Mustafa Deniz et al.²⁰ suggests the possibility of link between agenesis of PL to the genetic level. In our study, the dissection was carried out as per the steps suggested in cunning ham manual.²¹ On a lighter note, a 'smile showing cheek dimples' is sufficient to confirm the absence of PL without any tests.

CONCLUSIONS

Panniculus carnosus is the least studied area. The dearth of studies on prevalence of cheek dimples in different ethnic population in the literature is testimonial to the fact. We present following points to conclude the study.

1. Prevalence of absence palmaris longus is around 13.5 %
2. Unilateral agenesis of PL is 10 %.
3. Absence of palmaris longus has strong association to presence of cheek dimples. Up to 45 % of PL agenesis will show either unilateral or bilateral cheek dimples.
4. Both palmaris longus and panniculus carnosus is considered to be the 'vestigial', which may be the reason for its associated relation to one another.
5. Studies on cheek dimples, panniculus carnosus are very scanty in literature; more studies might reveal interesting correlation
6. The grip strength of the wrist is unaffected due to palmaris longus agenesis. However, the pinch grip of 4th finger with thumb appears to be certainly decreased.
7. Mishra's test proves to be the best in demonstrating the PL.
8. Clinical importance of absence or variations in panniculus carnosus, if studied and compared to certain 'syndromes'

or 'mesodermal origin deformities', might help in early diagnosis.

9. A radiant smile displaying the cheek dimples, has 50 % possibility of absence of PL.

Data sharing statement provided by the authors is available with the full text of this article at jebmh.com.

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