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THE PHANTOM PHENOMENON IN AMPUTATED FINNISH WAR VETERANS

BY

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INTRODUCTION AND REVIEW OF LITERATURE

It is a known fact that the majority of amputees, after the loss of a limb or a major part of it, retain a more or less distinct impression of either complete or partial existence of the lost member. Some feel this phantom phenomenon throughout their lives while for others it weakens or is otherwise modified, and in some cases disappears. It almost seems as if the phantom phenomenon of an amputee were something natural, though a sensation of a non--existing thing is usually considered unnatural. Such sensations have been claimed to be illusions, or even hallucinations. When a phantom sensation only comprises a part of the lost limb it does not follow the anatomical areas of the nerves of the limb in question. It is regularly found that the distal, most innervated and differentiated parts of the limb, those that receive the greatest amount of sensory experience from the world outside, are felt most clearly. Many amputees feel that they can move the phantom or its parts. Attempts have even been made to utilize the movements of a phantom limb for guiding the movements of an upper limb prosthesis at will (SIEHLOW 1951). Various factors, e.g. use of prosthesis and treatment of the stump, can affect the phantom's size and other properties. The phantom may be painless, for some even pleasant, or extremely painfull. The pain may differ in degree at different times and under the influence of different factors. Some believe that phantom pain only represents a more intense degree of phantom sensation (FEINSTEIN & *al.* 1954) which probably results from disturbed function (WEISS 1956, WÜLLENWEBER 1958).

Amputees often suffer some pain in the stump. Even if the pain produced by acute or chronic trauma is disregarded, pain can

usually be found in perfectly blameless amputation stumps too. These pains have many causative factors, but thorough investigation often discloses that no pain arising from the stump itself is involved and the complaint must be referred to a phantom. Most of the amputees can distinguish stump pain from phantom pain, but not all.

The phantom phenomenon has been studied a great deal. Early phantom studies are few, which is no wonder since before the era of asepsis most amputees died soon after the operation. According to the literature (WEISS 1956, and others), however, Ambroise Paré mentioned the phantom phenomenon as long ago as 1511. Weir MITCHELL (1872) obtained his investigation material from the numerous amputees of the American Civil War. In the last decades there has been abundant material to study everywhere, and so the literature dealing with the phantom phenomenon is now extensive. Nevertheless, great disunity prevails as to the pathogenesis of the phenomenon.

In Finland, the phantom phenomenon has been studied at least by JALAVISTO (1942, 1946, 1950 *etc.*), ELLONEN (1946), KALLIO (1949, 1950), CEDERCREUTZ (1954, 1961) and WALLGREN (1954).

The tendency has been to explain the etiology of the phantom phenomenon in mainly two ways. The supporters of the so-called central theory (e.g. HEAD 1920, SCHILDER 1920, RIDDOCH 1941, JALAVISTO 1942, HABER 1956, WÜLLENWEBER 1958) believe that the phantom is there because a 'body image', formed and fixed in the person's sensorium in the course of years, remains intact despite mutilation of the body. The amputation only as it were lays bare this immaterial shape, built up by sensations and engrams, from the covering material part of the body. This body scheme is complete by the age of 5—7 years (BAILEY & MOERSCH 1941, BROWDER & GALLAGHER 1948, RIESE & BRUCK 1950), and phantoms are only present in persons amputated after that age.

The supporters of the peripheral theory (MITCHELL 1872, PITRES 1897, FOERSTER 1931, LIVINGSTON 1944, WHITE 1944, FALCONER & *al.* 1946, 1953) claim that the pathological sensations

of the stump, e.g. irritation of a neuroma, are responsible for phantom. The peripheral theory is supported by the observation that an amputee on whom a Krukenberg's kineplastic amputation has been performed feels his phantom limb split (KALLIO 1949). The peripheral theory is strongly contradicted by the fact that the parts of limbs that the phenomenon affects do not follow the peripheral nerve distribution, and the phantom is not an anatomical copy of the missing part of the body; by the fact that it is there immediately after amputation before neuromas have developed, and that it persists even though all known afferent tracks are severed.

There are also those who believe in a purely psychogenic origin (HEAD & HOLMES 1911, BAILEY & MOERSCH 1941, PFLÜGGE 1943, RANDALL & *al.* 1945, KOLB 1950, 1952). It is not at all difficult to describe emotional disorders of the amputees in support of the theory, but there is also good reason to believe that a phantom pain, having persisted long and severely, is their cause and not result (LIVINGSTON 1944, FALCONER 1953). Closest to truth is perhaps the opinion held e.g. by FEINSTEIN & *al.* on the etiology of the phantom phenomenon: »Demonstrable pathological conditions in the stump, in the conducting system between the stump and brain, in the brain, and in consciousness should be considered as different parts or aspects of one continuum.» This opinion seems to be supported also by LUNN (1948), BORS (1951) and SOUCKS (1951).

In a study published in 1955, INMAN and EBERHART found that 80 per cent of the amputees were »substantially free of pain», while some 10 per cent had »incapacitating pain» which prevented successful rehabilitation (these figures cover both stump and phantom pain). CANTY (1958) again found that over 50 per cent of amputees experience stump pain or discomfort sufficient to discontinue temporarily the use of their prosthesis», while 15 per cent had »major pain problems» because of the prosthesis, for reasons arising from the stump, or owing to the phantom. Although all the amputees in Canty's series had the phantom sensation immediately after amputation, it did weaken in 1—2 years,

and serious incapacitating phantom pain (»of a major degree») was only present in some 2 per cent. Livingston's series included less than 10 per cent of amputees with severe, permanent phantom pain. EWALT & *al.* (1947) and HENDERSON & SMYTH (1948) put the figure at less than 1 per cent. According to RIDDOCH, 50 per cent had a more or less painful phantom, while for PITRES' series the figure was 97 per cent and in LERICHE's (1937) 98 per cent.

THE PROBLEMS

The present paper can hardly throw any additional light on the etiology of the phantom phenomenon nor on the many problems of its treatment. (The lack of physiological and psychological expertise is doubtless a great weakness in making a study of this kind.) It is obvious that the phantom phenomenon can only be further clarified by experimental investigations that are difficult to realise. However, the series studied was so extensive and so homogenous that it may produce replies to the following questions:

What is the incidence of phantom phenomenon?

What is the relationship between the phantom phenomenon and the condition of the stump?

What is the phantom phenomenon like in this series of war disabled?

How does the phantom change in the course of years?

How do the use of a prosthesis and activity of the stump affect the phantom?

What is the practical importance of the phantom to the amputee?

What results have been achieved from treatment of phantom pain?

How can the replies to the above questions be utilized in amputation surgery, in the after-care of amputees and in the production of prostheses?

THE SERIES

All the subjects examined were Finnish war casualties, all men. Their ages during the period of the study ranged from 21 to 71 years, average 42 years. The lapse of time since the primary amputation ranged from 12 to 38 years, average 14 years. Several of them had subsequently undergone various stump repair operations and even re-amputations 0—18 years after the primary amputation.

The subjects may be classified as follows, according to the limb amputated:

TABLE 1. *Material.*

Above elbow amputation	(AE)	163
Below elbow amputation	(BE)	97
Above knee amputation	(AK)	267
Below knee amputation	(BK)	433
Foot amputation	(F)	9
Double amputees		31
Total		1,000 amputees

METHOD

The data required were compiled from replies to a detailed questionnaire of 91 questions circulated to some 4,000 amputated war casualties. The questions were formulated to overlap to some extent, and so an incomplete reply usually was complemented by the reply to another question. For the present study, the data contained in the first 1,000 complete but otherwise unselected replies were employed. Furthermore, 300 amputees were seen in person, and it was found that the replies to the questionnaire on this matter of subjective observations were highly satisfactory. For the sake of uniformity, the data given in the following were assembled from the written replies except in the few cases when, for the sake of clarity, a point had to be analysed in greater detail. These cases will be indicated.

RESULTS

Incidence of phantom

The phantom was felt after amputation by 945 (94.5 per cent). Forty (4 per cent) remembered that they had not felt the phantom until 6—12 months after amputation, 15 (1.5 per cent) until over 2 years and 3 of them not until over 10 years had elapsed. It is obvious that these reports can only be taken to show the trend since the long lapse of time doubtless led to mistakes.

At the time of the study, 847 (84.7 per cent) had a phantom which was felt in different ways and degrees.

153 (15.3 per cent) were phantom-free.

Stumps

Before trying to gain a more detailed idea of the 'phantom world' of the subjects, it is necessary to find out about the type and condition of their amputation stumps. One of the weaknesses of the present study is that it was impossible to make a personal examination of all the stumps. Whoever has had a lot to do with amputees will know, however, that the good or poor condition of the stump is best assessed by the amputee himself, especially if he already has an experience of 12—38 years. Many a stump that may look blameless is poor because of pain and tenderness, while many miserable-looking stumps subjectively and in practice may be good.

Stump pain

150 amputees (15.0 per cent) reported that no significant pain[1]) or tenderness was present in the stump.

TABLE 2. *Percentual distribution of the intensity of pain and/or tenderness of stumps.*

Severe	Slight	Varying	Absent	Total
18	60	7	15	100

This stump discomfort, often in an anatomically poor stump, prevented or considerably restricted the use of a prosthesis in 13 per cent of the series. In the different amputee groups sufferers from stump pain or tenderness ranged from 81 to 100 per cent. At its worst, the discomfort was highly significant; for instance, 24 per cent of the above elbow amputees gave it as the reason why they never wore a prosthesis. Incidentally, the total series included 7 (0.7 per cent) amputees who for some other reason, e.g. because of a too short stump, the little help the prosthesis gave, or habitual attitude, never wore a prosthesis.

All the amputees who reported tenderness of the stump claimed that it was constant.

Stump pain occurred as shown in the table below.

TABLE 3. *Pain in the stump* (per cent of total material)

always	often	seldom	total
17	21	4	42

The intensity of the pain is illustrated by the fact that the pain often disturbed sleep and occasionally prevented it for 50 per cent and made work difficult for 35 per cent of those suffering from stump pain.

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[1]) Here and in the following the word 'pain' will be used although the amputees described their pain by a vast variety of expressions (burning, shooting, crushing, stabbing, aching, tearing, etc.)

Relationship between stump pain and phantom

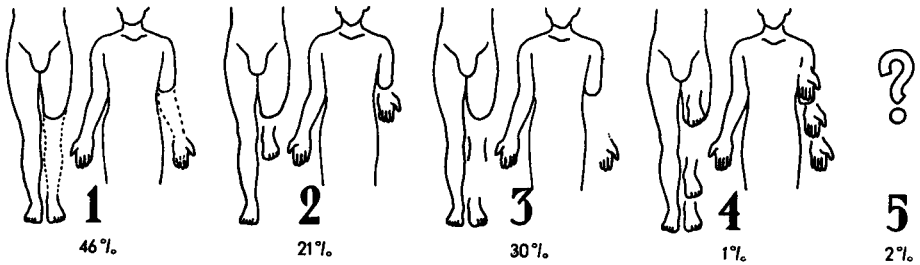
The phantom was present in 70 per cent of the cases with a good stump (i.e., a stump with no pain or tenderness).

The phantom occurred in 87 per cent of painful stumps.

Sixty one per cent of the phantom-negative amputees had pain and/or tenderness of the stump.

Size of the phantom

TABLE 4. *Size and length of phantom.*



The percentages include the corresponding figures for upper and lower limb.
1. Equal in length to healthy limb. 2. Shortened. 3. Partial. 4. Varying.
5. Uncertain.

It may be mentioned that the group of phantoms of varying size also include e.g. such an exceptional phantom sensation as the enlargement of the phantom limb to larger than normal limb size.

It is obvious that the information on phantoms of normal length and on partial phantoms is inexact and even confused. An amputee who has the sensation of partial existence of the limb feels this part at the normal distance and so reports his phantom to be of normal limb length. The more detailed the questions put to the amputee about the properties of his phantom, the more often it turns out that the only parts felt of the phantom limb are the most distal or those that were otherwise most in contact with the environment (Fig. 1) (cf. LIVINGSTON 1945). On checking the point with the 300 amputees examined in person, it proved that only about 5 per cent felt their phantom to be of normal length and shape. The normal length in the reports, therefore, mostly implied

that the phantom comprised the sensation of a small distal part of the limb only, but this part was at the normal distance from the stump. The part felt was often a hand or a foot, more frequently still the fingers or toes or just the most important of them like the big toe, the thumb, forefinger, sometimes the palm or heel, occasionally also the ankle, seldom the region of the knee or elbow. The phantom, therefore, comprised those parts of the lost limb which, according to PENFIELD an BOLDREY (1937), had the most extensive representation in the cortex of the brain.

No one reported the sensation of a multiple phantom limb (cf. CEDERCREUTZ 1961).

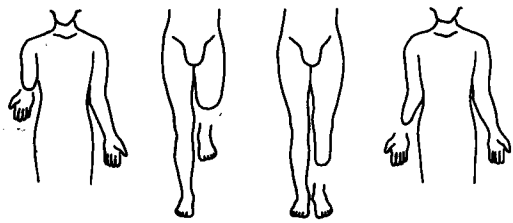
TABLE 5. *Incidence of phantom sensations in the phantom-positive amputees* (per cent of the total of the 847 phantom-positive)

Always[1])	Often[2])	Seldom[3])	Varying
44	23	32	1

Phantom incidence in the different amputee groups

Disregarding the groups of double amputees which comprised a few persons only and because of their limited extent permit

TABLE 6. *Incidence of phantom after amputations at different heights.*



[1]) 'Always' is here a relative concept. The replies obtained to the qualifying questions show that few really felt the phantom all the time they were awake. For amputees with such a sensation the phantom was usually persistently and severely painful, and always very distinct. By 'always' most amputees meant that the phantom was felt every time they thought of it. In this respect the sensation was fairly normal: we do not 'feel' the existence of our limbs unless we think of them or accept sensations by them.

[2]) 'Often' here means every day but not always.

[3]) 'Seldom' implies here more rarely than 'often'.

Fig. 1. Some of the commonest phantom types.

of no generalizing conclusions, the incidence of phantom as illustrated by Table 6 seems to be greater after proximal than after more distal amputation. For the double amputees who were examined or who answered the questionnaire, the phantom was unfailingly felt in both amputated limbs.

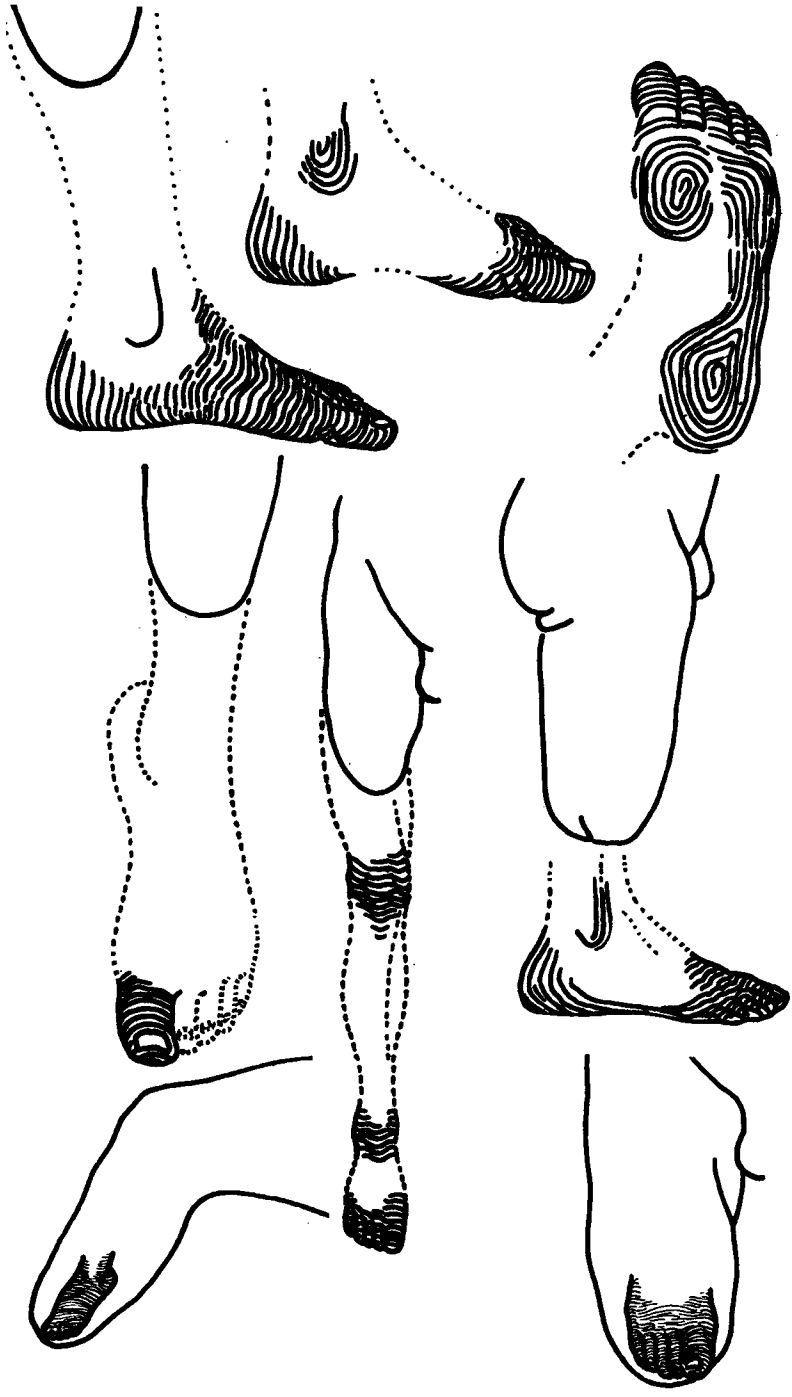
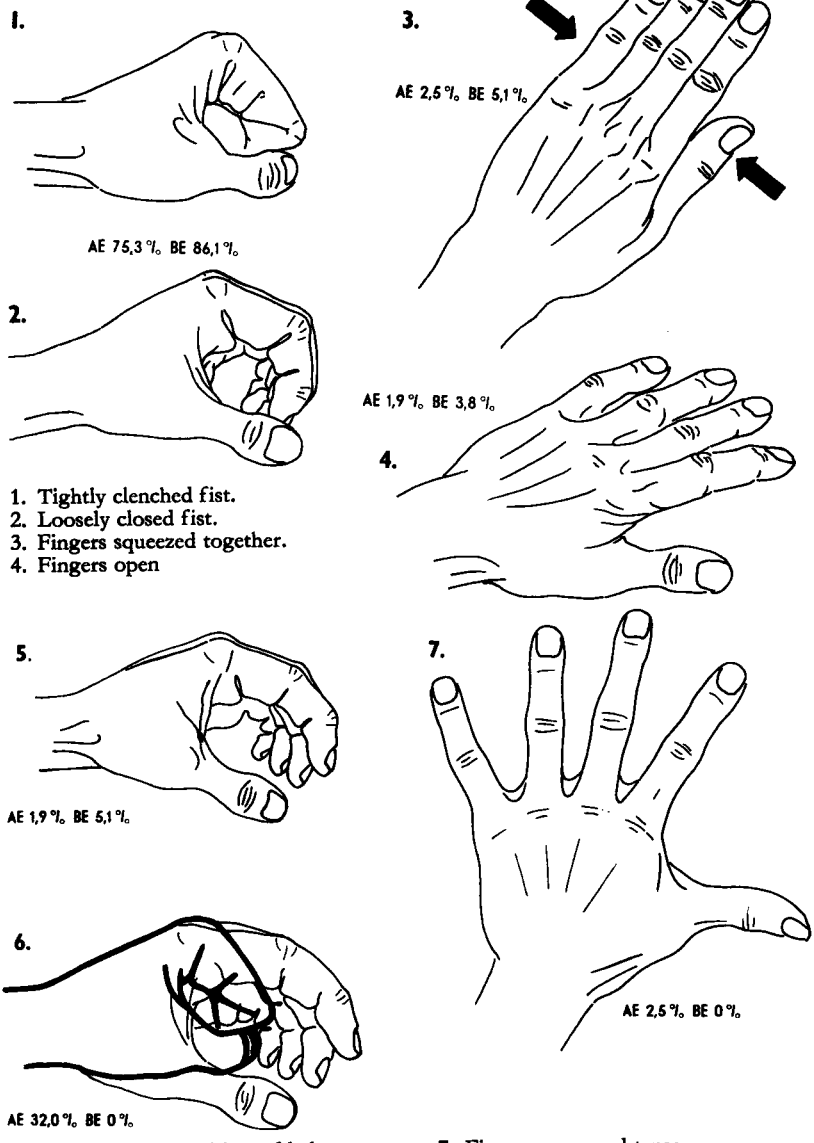
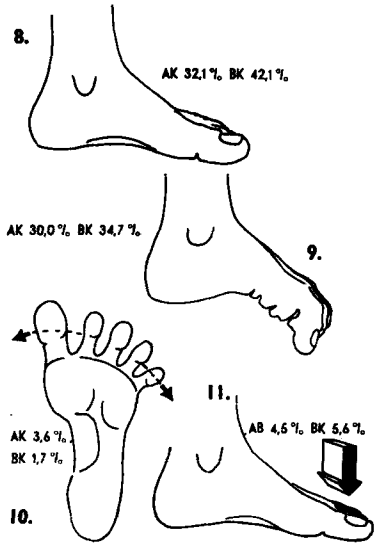


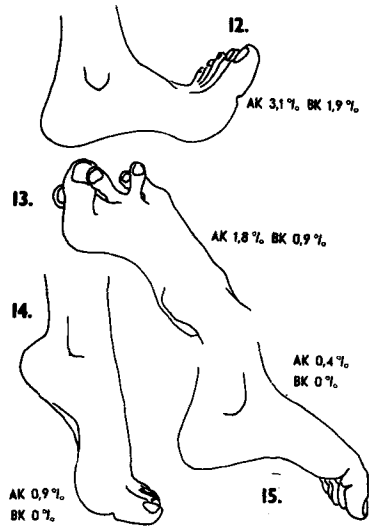
TABLE 7. *Position of the phantom*



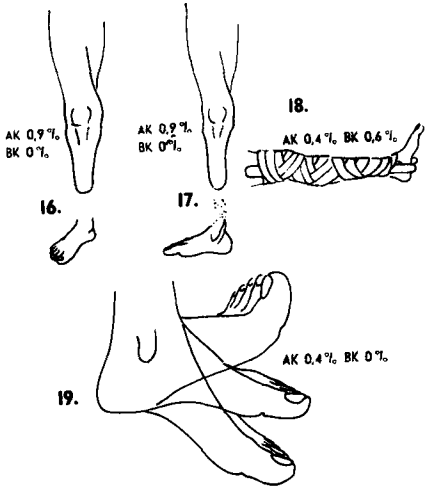
1. Tightly clenched fist.
2. Loosely closed fist.
3. Fingers squeezed together.
4. Fingers open
5. Hand in the position of balance.
6. Hand clenched differently at different times.
7. Fingers open and tense



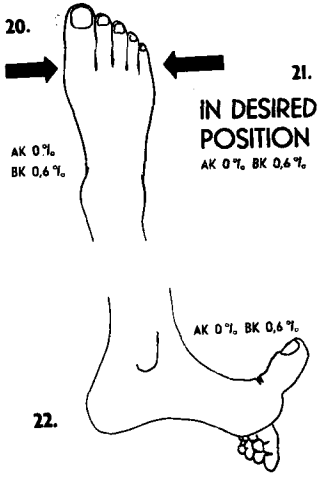
8. Foot in natural position.
9. Foot and toes in plantar flexion.
10. Toes spred and tense.
11. Toes stretched and pressed against some lower support.



12. Toes in strong dorsal flexion.
13. Toes intertwined.
14. Foot in a rigid equinus position.
15. The distal part of foot and toes hanging slack.



16. Foot turned sideways.
17. Foot strongly twisted sideways.
18. Limb in bandage as if after first-aid.
19. Position of foot and toes varies at different times.



20. Toes squeezed together.
21. Foot in desired position.
22. Big toe in extreme dorsal flexion, other toes in rigid plantar flexion.

Position of the phantom limb

is illustrated by Table 7. (It should be noted that these pictures do not attempt to indicate the extent of the phantom but only its usual position. Phantom movements have not been studied.)

Similar sensations were described by the double amputees. Their phantoms are usually not symmetrical even if the amputations seem to be so.

Phantom pain

The phantom was painless for 20 per cent of the 847 phantom--positive, and painful to varying degree and in different ways for 80 per cent. None of those who answered the questionnaire in writing or those who were examined in person reported the phantom sensation to be irritating if it was painless. On the other hand, no one found the phantom sensation pleasant.

Type of phantom pain

Amputees described their phantom pain in the most varying ways. Quite often it was felt like torture performed by means of various implements of everyday life. Some of the commonest instances are assembled in Fig. 2. Phantom pain differs in many ways from other pain sensations. It often ends if the patient's mind is occupied elsewhere. The statement that 'phantom pain is so severe that one must go to sleep in the middle of work' sounds extraordinary — the man falls asleep readily and the pain disappears. Yet the same man claimed that his phantom pain disturbed his night's sleep. One amputee reported, laughing, how at that very moment he suffered from 'a hell of a phantom pain'.

Incapaciting phantom pain

The incidence of severe, persistently incapacitating phantom pain was as follows:

TABLE 8. *Incapacitating phantom pain occurred:*

In	3	per	cent	of	the	total	AE	amputees
»	1	»	»	»	»	»	BE	»
»	3	»	»	»	»	»	AK	»
»	2	»	»	»	»	»	BK	»
»	16	»	»	»	»	»	Double	»

Just under 3 per cent of all the amputees suffered from persistent incapacitating phantom pain. For a smaller series, INMAN and EBERHART gave the percentages as 4, CANTY 2, EWALT & *al.*, HENDERSON, and others below 1 per cent.

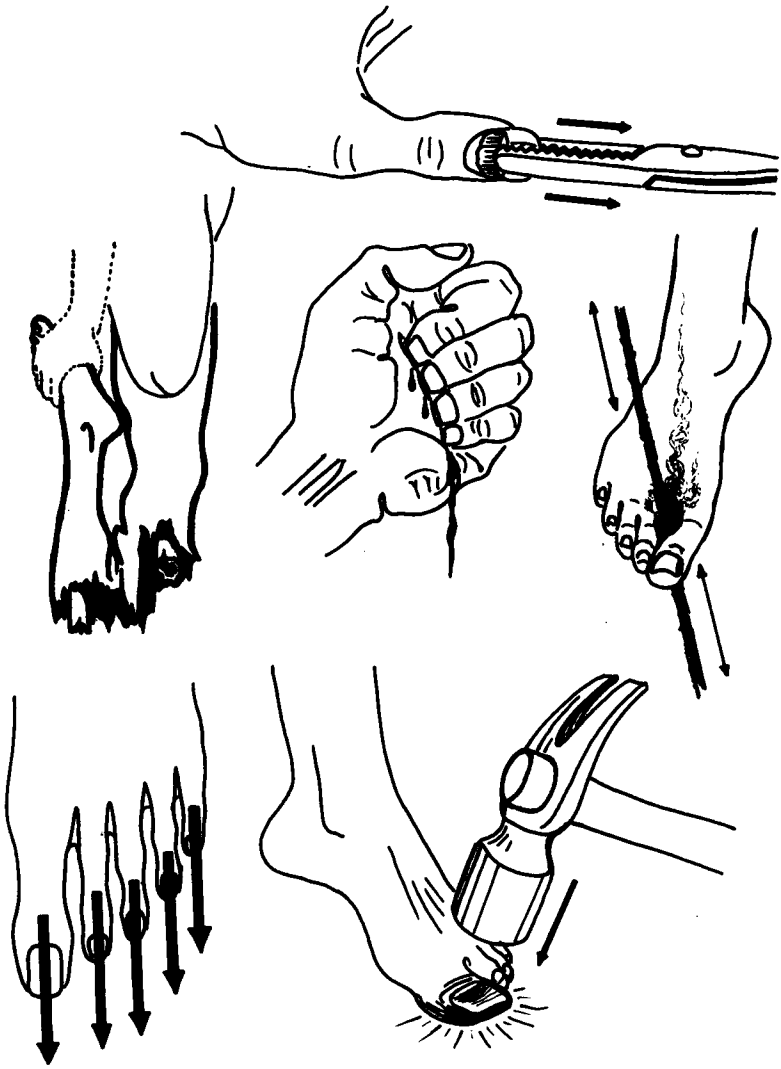
It is natural that the incapacitating pain should be a highly subjective sensation. Discomfort that totally incapacitates one person may be easily tolerated by another. For the present study, phantom pain was classified as incapacitating (severe, disabling pain) if it disturbed the amputee day and night, and persistently prevented him from working or getting a night's rest. All those referred to this group were compelled to take drugs regularly for their pain. A large number had, because of the pain, submitted to surgery of the stump and nerves, spinal cord or brain, hypnosis and other therapeutical methods — all to no avail.

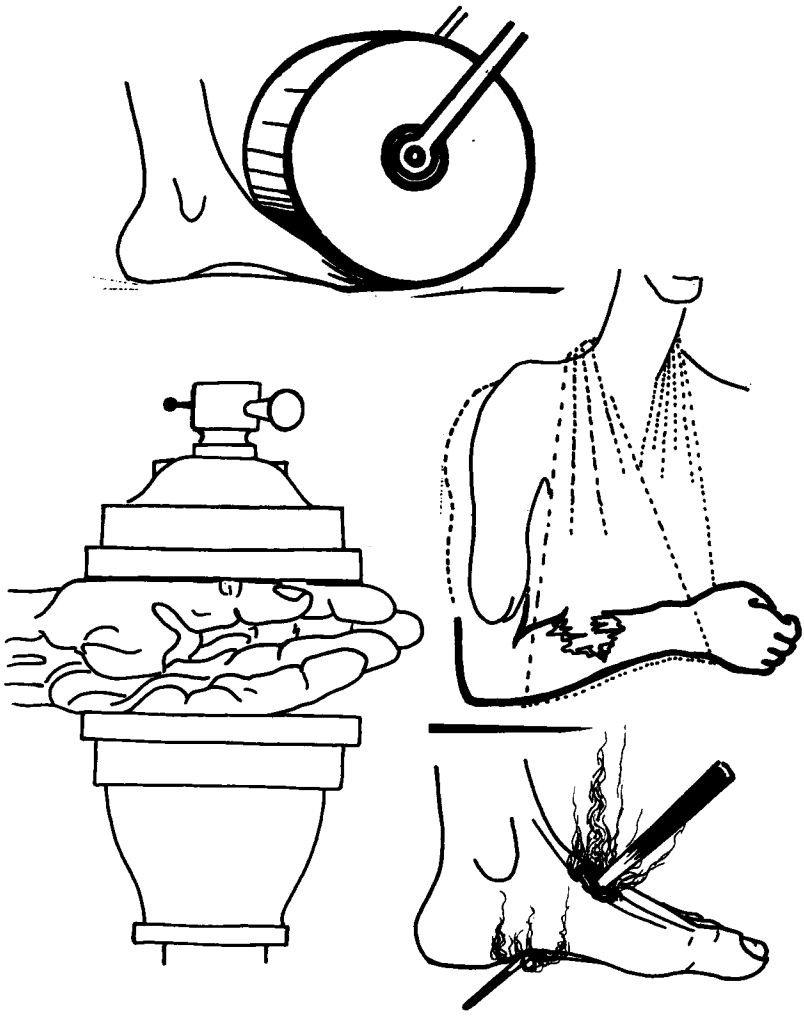
The factors provoking phantom pain

are most varied. The following is a list of the commonest, in their order of incidence:

Strain on the stump and the whole person	185	cases
Touching the so-called trigger point of the stump	184	»
Weather changes	158	»
Poor fit of prosthesis	58	»
Coldness	57	»
Thinking of the lost limb or phantom limb	26	»
Removal of prosthesis	19	»
Moving the phantom	18	»
Moving the stump	10	»
Depression	7	»

Fig. 2. Commonest descriptions of the phantom pain.





Causes which were less frequent but present in more cases than one were:

Pain in or injury to the stump, fever during some illness, other illness or poor condition, perspiration, sitting, rest, nervousness, tension or excitement, fatigue, the sauna, defecation, vibration, wearing of prosthesis, hangover, draught, unpleasant things (e.g. seeing somebody else's wound, loneliness, bad temper, heat, getting wet, walking quickly, beer, awkward posture, itching, sudden changes in conditions, light stroking of stump, massaging the stump, etc.).

In many cases different causes were in play at the same time.

Factors eliminating phantom pain

Just as there were many provoking factors, there was a great variety of means to stop the pain. But their effect was always transient; no treatment proper is in question.

The most popular methods were:

Holding the stump upright
Hanging the stump
Complete rest of the stump
Movements of the stump
Walking vigorously
Walking slowly
Swimming
Shaking the stump
Swinging the stump
Slow movements of the stump
Cold water
Hot water
Warm water
Alternate hot and cold baths
Massaging the stump
Knocking at the stump
Beating the stump numb
Pressing the stump
Pressing on the trigger point
Distracting the thoughts
Concentrating on the phantom
Dry heat
Sauna
Tobacco

Drugs
Alcohol
Hot sand
Spirits rub
Furthermore: coffee, sense of humour, strong attitude against pain, cursing, use of prosthesis, removal of prosthesis, complete rest, hard work, coitus, urination (AK), gaiety, nice weather, rowing (AE), etc.

The above lists show that for different persons the provoking and the eliminating factors are often the same. Many definitely effective factors seem completely ineffective everyday happenings, others again have a pronounced effect either on the organism or the psyche. There is also persistent phantom pain apparently not provoked by any external factor or psychic function. Nor has it always been possible to find any lay relief for the worst pain.

Development of phantom and phantom pain in the course of years

It is obvious that the phantoms which are now felt as shortened originally were the length of the lost limb. It has not been possible afterwards to time their gradual shortening. Otherwise, too, the dates of the changes in the phantom are so difficult to establish — unless connected with some therapeutical measure — that they have not been taken into account here. The present work was limited mainly to studying the changes in the intensity of phantom pain.

The distinctness of the phantom and phantom pain was reduced between amputation and the date of examination as follows:

TABLE 9. *Phantom pain relieved.*

AE	amputees		9	per	cent	of	the	phantom-positive
BE	»		18	»	»	»	»	»
AK	»		17	»	»	»	»	»
BK	»		12	»	»	»	»	»
F	»		1	»	»	»	»	»

Phantom and phantom pain gained in intensity as follows:

TABLE 10. *Phantom pain aggravated.*

AE	amputees	4 per cent of the phantom-positive
BE	»	6 » » » » »
AK	»	9 » » » » »
BK	»	7 » » » » »
Double	»	6 » » » » »

A total of 15 amputees (1.5 per cent) reported that the phantom disappeared spontaneously 1 week — 13 years after amputation. Very many reported that the occurrence of the phantom had become less and less frequent, but there are instances of the opposite, too.

Influence of prosthesis-wearing on the phantom

About 35 per cent of the amputees reported that the wearing of a prosthesis affected the phantom sensation. The effects of a faultless prosthesis only are discussed here. Table 11 lists the principal observations.

TABLE 11. *Influence of prosthesis-wearing on the phantom*

Phantom is lengthened to equal the prosthesis or less		9 per cent
Phantom is merged into the prosthesis		22 » »
Phantom is shortened[1])	below	1 » »
Phantom and phantom pain disappear	below	1 » »
Phantom pain is aggravated		0.5 » »
Amputee reports several effects[2])		1.5 » »

Amputees sometimes exploit the phenomena described above, especially where the wearing of a prosthesis either removes or reduces the phantom or phantom pain. Some amputees may by

[1]) This group includes e.g. a foot amputee whose foot phantom is shortened as if squeezed together, but the toes remain whole.

[2]) A foot amputee feels that sometimes »a heavy shoe pressed the phantom foot exhaustingly», that is to say, the strain on the stump is felt as such in the phantom limb.

this means secure their night's sleep. Others again believe that the wearing of a prosthesis is more natural when his »own limb», the phantom, is lengthened to equal the prosthesis or merges with it.

Results of treatment of phantom pain

In order to eliminate the high potential error, the data for this part of the study were collected only from the 300 amputees seen in person. Nevertheless, there were some patients who could not say for certain whether the treatment was given mainly for phantom pain or for stump discomfort. In any case, the effect of treatment on the phantom is recorded here. The following table lists the treatments and the results. Methods of physiatric treatment are not included as the patients are least able to provide reliable information on them.

The treatments listed, therefore, produced permanent and complete relief (after a follow-up period of 1—18 years) for 8 per cent, permanent relief for 29 per cent, transient relief for 11 per cent,

TABLE 12. *Effect of certain treatments on phantom pain.*

	Phantom pain disappeared for good	Phantom pain was relieved	Phantom pain disappeared or was relieved temporarily	No effect	Phantom pain was aggravated	Cases
Sympathectomy	2	2	1	9	1	15
Revision of stump[1]) ..	2[2])	9	2	13	1	27
Extirpation of neuroma	—	6	5	8	2	21
Reamputation	2	4	—	3	—	9
Lobotomy	—	—	—	1	—	1
Hypnosis	—	1	—	2	—	3
Total	6	22	8	36	4	76

[1]) Only stump revisions made a minimum of 2 years after primary amputation are included.

[2]) In both cases, an extirpation of the fibular stump was involved.

no effect at all for 47 per cent, and aggravation for 5 per cent of the patients. The most effective treatment seems to have been reamputation which in fact includes the treatments that were next most effective, viz. revision and removal of neuroma. The effect of sympathectomy, too, is worth noting.

However, the old observation is confirmed that none of these treatments has any specific effect on phantom pain and that phantom pain or the phantom phenomenon is not a functional disorder of a given, precisely delineated area of the nervous system.

Effect of post-operative rehabilitation on the amputee's phantom phenomenon

The writer holds the opinion, shared by e.g. BOSHAMMER, WEISS and WÜLLENWEBER, that early post-operative rehabilitation has the most favourable effect in relegating the phantom phenomenon to a secondary position in the amputee's life. This point cannot, however, be studied from the present series as the lapse of time since the amputation is too long. The subjects as a rule received their prostheses 6—24 months after amputation, most of them obviously unnecessarily late as a result of war-time difficulties. The standard of prostheses in our country at that time was not very high. From the point of view of post-operative rehabilitation and prosthetic service, the treatment of our amputated war veterans must be considered unsatisfactory in the main. On the other hand, it is remarkable that the phantom discomforts reported on above are not essentially more numerous or severe than those presented in some statistics compiled from apparently better conditions (cf. above).

DISCUSSION AND CONCLUSIONS

The phantom phenomenon, which probably must be equated in the first place with a complication of the amputation, occurred in some 85 per cent of the amputees of the present series examined an average of 14 years after amputation, and 80 per cent of them reported a painful phantom. Since the phantom pain was so severe that it was disabling in nearly 3 per cent of the patients, the complication is worth remembering for those, admittedly rare, cases with no vital indications for amputation.

A finding of interest to amputation surgery is that with good stumps the phantom phenomenon is usually less severe than with poor stumps.

The ways in which the phantom phenomenon occurred and the other characteristics of phantom sensation are very much the same as those described by other writers.

The phantom phenomenon and phantom pain generally change in the course of the years. The change is for the good, i.e. relief of sensation and pain, about two or three times more often than for the worse.

Wearing an artificial limb affected the phantom of over one-third of the amputees, and the effect was usually either void of subjective significance or in one way or another positive to the amputee. There might be some justification for believing that this effect of wearing a prosthesis is the joint result of the artificial limb as such and the accompanying activation of the stump towards the original function of the lost limb.

The practical importance of the phantom phenomenon to the amputee must be considered negative. Every amputee without a

phantom is definitely better off than his phantom-positive companion in misfortune.

The percentages quoted above for phantom pain are weighty arguments for the negative practical significance of the phantom phenomenon. The figures gain significance from the knowledge of how little phantom pain can be affected and how much the success or aggravation produced by therapeutic attempts is still haphazard today. It is essential, however, to try and analyse the factors provoking phantom pain in each individual case, although some of these factors are hard to escape. Nevertheless, the precise and skilful making and fitting of the prosthesis, for instance, is of great value. Parallelly with, and as an integral part of, good prosthetic service, every amputee should be rehabilitated to active and useful life with as little delay as possible.

SUMMARY

A questionnaire on the phantom phenomenon was answered in writing by 1,000 amputated war veterans, and 300 were examined in person.

The lapse of time from the amputation ranged from 12—38 years. At the time of the examination, 15 per cent were without a phantom. In 85 per cent the phantom occurred in the most varying ways.

About 70 per cent of the amputees with a good stump had a phantom, and for those with a poor stump the percentage was about 87. Some 61 per cent of the phantom-negative had stump discomfort.

The phantom of 20 per cent was painless, of 80 per cent painful. None considered the phantom phenomenon agreeable.

About 3 per cent of the amputees had a persistent incapacitating phantom pain resistant to treatment.

The phantom pain was most varying in type and intensity, and the factors provoking and relieving it were numerous.

About 5 per cent of the amputees felt their phantom in the size and shape of the whole lost limb; others felt only parts of the lost limb, usually considerably shortened.

The phantom sensation of some 44 per cent was continuous, others had it less frequently.

The incidence of phantom was higher after proximal than distal amputations. The double amputees felt the phantom for both lost limbs in every case studied.

In the course of time, the phantom tended to be relieved 2—3 times as often as it tended to be aggravated.

The wearing of a prosthesis affected the phantom directly in about 35 per cent of the phantom-positive cases, and the effect was mostly insignificant, sometimes favourable.

The results of therapy for the phantom pain in the present series, too, were on the whole unsatisfactory, and the effect of treatment seemed mostly haphazard.

The incidence of the phantom phenomenon and phantom pain, and the degree of severity of the phantom pain, are of such a magnitude that they must be borne in mind in considering and performing an amputation and when the amputee is rehabilitated.

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