

On the prevalence of septic wounds of the hands and fingers among those employed in the fishing trade - with illustrative cases.

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Great Grimsby Lincolnshire is without doubt the most important fishing port in Great Britain, nearly five thousand men and apprentices being employed on board its steam trawlers - steam cutters and sailing smacks.

Any observant person who comes into contact with these men and lads, and with the members of that large army of labourers attached - in the capacity of cleaners, sorters, packers and porters - to the fishing trade; must be deeply impressed by the number of mutilated and maimed hands & fingers which are to be met with in all these different classes of working people connected with the staple industry of the port - the results for the most part of seemingly trivial and consequently often-neglected injuries, received while being employed at their usual occupation.

During the nine years which I have spent in Hospital and private practice in Grimsby, over two hundred cases of septic poisoning of hands and fingers, in men & boys engaged in the fishing trade, have come under my personal observation and treatment

In the majority of these cases a clear history of the cause was forthcoming and this cause, in all

but few exceptions was puncture, by means of the fins of certain fishes or ~~the~~ the bones of decomposing fish of all kinds, through the non vascular & thickened epidermis into the vascular & fibrous cutis vera or even into the still deeper structures of the finger or hand as the case may be.

It is the usual custom on the greenish fishing vessels to trawl day and night, and for all but those navigating the vessel to set to work, immediately the trawl is hoisted on board, to arrange the fish into their several species and sizes.

This is done as speedily as possible - and in the hurry or darkness it often comes about that a fisherman's hand grasps a decomposing fish with the result that the needle like bones are pushed through the rotten tissues into the hand or finger, and the septic poison is introduced.

Trawling up of dead fish ^{and fish remains} is a very usual occurrence - many fish I am told being killed by the trawl in passing over the sea bottom. many others are fish worthess as an article of food, & so are thrown overboard, sink and die, and after some days are brought to the surface again and into men's hands by the

trawl of another steamer or smack fishing over the same ground.

As for the fish labourers — Their work compels them to handle fish in every stage of freshness or staleness — some of a boats' catch having been packed in ice perhaps two — three or four weeks. This packing in ice certainly prevents speedy decomposition; but there is without doubt in all such voyages a certain quantity of the earlier caught fish which must have reached some of the stages of putrefaction by the time they have to be arranged for the market.

If then one of these labourers suffers from a scratch or cut or any abrasion of the ~~skin~~ skin — and works amongst this stale fish — in inflammation of the wound issues of a more or less virulent nature almost invariably.

This inflammation caused by puncture & inoculation, or by inoculation of septic matter into an already existing wound, runs a certain characteristic course — the chain of symptoms in all cases varying only in severity, according to, the amount of poison introduced — the structure and position of the part inoculated — and the length of time elapsing between inoculation and

proper systematic treatment of the wound.

In order to illustrate this I have chosen the histories of four patients, from my list of cases, which I consider typical examples of the various stages to be met with in inflammation caused by Fish Sepsis, and round these with but very few exceptions might be grouped all those cases I have met with in my work.

The first is that of H. S. aged twenty years, by trade a fish salesman and fish merchant.

Being in a small way of business he has to do most of his own sorting and packing when sending fish to his retail customers scattered over the country.

His story is this: — Yesterday morning while working among rather undersized plaice & other small fish which had been kept in ice on board a fishing steamer for some days, and were consequently not recently caught, he remembers to have pricked his hand — the right one — in several places.

In anticipation of poisoning — he, having suffered from poisoned fingers before, on arriving home that afternoon, washed his hands thoroughly with Carbolic Soap & kept them steeped in hot water for an

hour or so. The pricks must have been so minute that he was unsuccessful in localizing the points of penetration. He was able to do this next day for, on rising in the morning, he noticed patches of redness on two fingers of the right hand.

There being no pain to speak of he went down to the Fish Dock as usual with a view to following the ordinary business routine of his day's work.

During the day however these red patches noticeably increased in area. They became appreciably inflamed - so much so indeed that being afraid he returned to his home - fomented his hand again with hot water and consulted me the same evening.

The condition of the hand, as I found it, was as follows:-

On the inner side of the forefinger of the right hand there was an area of redness elevated slightly above the surrounding tissue, and with well defined edges. This redness faded on pressure. The pressure evidently did not cause any pain in the part for the patient gave me to understand that rubbing the spots was quite an agreeable occupation to him.

The same description applied to a similar state of matters on the outer side of the little finger

of the same hand - the extent of the patch being rather less.

Under the treatment which I practise in such cases and which I will specify further on in this paper, the redness and swelling of this little finger by the time I saw it again (next morning) had become decidedly smaller on every side with the exception of that nearest the back of the hand.

The forefinger remained in much the same state as the day before.

By the third day from the onset of the inflammatory symptoms - the treatment remaining the same - the original patches had disappeared; but the ring finger had become invaded and there was great heat & itching of the skin on its palmar surface. The lymphatics of the forearm up to the elbow were involved and showed ^{up} as red streaks

Still continuing my usual treatment the spreading of the inflammation was stayed and in the course of eight days from the commencement of the trouble the hand and fingers ^{had} resumed their normal state and there was no further extension to the lymphatics of the forearm. This latter condition clearing up quickly and satisfactorily in every way.

The Second Case I wish to give is that of a fishing apprentice who, while arranging what are called codlines, pricked the middle finger of his right hand right into the pulp of the terminal phalanx with a cod hook on which was part of a decomposing whelk.

This lad came to me at hospital the following afternoon. The whole finger was swollen and the end of it very painful and throbbing.

The point of puncture was clearly to be made out and this I made the centre of a deep & free incision which I considered the best treatment for the condition.

This bled freely and after a few minutes the boy felt great relief.

I am glad to say no further trouble ensued and there was no sloughing of the finger pulp.

Case 3

J. A. a fisherman consulted me in July of this year suffering from a very swollen and painful left forefinger. It began to pain him some four or five days before when he noticed his finger beginning to throb and swell. He felt sure he had pricked his finger while packing fish away in ice in the ship's fish room or well.

On examination the whole finger was found to be greatly enlarged - extremely painful and to give an impression of great tension.

The back of the hand was puffy and reddened, and pitted on pressure; likewise there was involvement of the lymphatics of the arm.

On the under surface towards the outer side of the ^{middle phalanx} ~~finger~~ the hardened skin was very tense with a central greyish white or dead coloured spot in it giving one the certain conviction that there was more or less pus working its way to the surface lying beneath the cuticle.

The man's general health before the onset of the inflammation was perfectly good. Since this happened he has had little or no sleep and has worked as well as he could the whole passage home.

For treatment, - with a sharp scalpel I shaved off little by little the epidermis at the point where I imagined the pus was pointing - until a head of rather thin greenish tinged pus did appear. Relief after a minute or two quickly came to the patient and then I dressed the finger with a boracic wool fomentation - the whole hand and forearm being placed on and bandaged to a well padded straight splint and then carried in a comfortable arm sling.

That night the patient had a good night's rest, and appeared a different man when he came next morning to have the limb redressed. On examining I found the forearm and hand less swollen and on the wool next to the wound a good deal of thin pus which had evidently found exit by means of the small hole in the Cutis. This hole I was readily able to enlarge with a pair of small, sharp pointed, & curved on the flat, scissors - the epidermis being easily removed for a considerable area round about it.

The boracic fomentations I kept on using for three days longer, and then without any difficulty at all I pulled out from the depths of the rounded hole a dense slough rounded in shape and about the size of a split pea.

This left a perfect little pocket, at the bottom of which could be seen the shining tendon sheath. Movement in the finger now was only slightly impaired - the redness and puffiness of the hand and arm had quite disappeared and the trouble was localized to the wound in the finger only.

The wound from this date was treated as any ordinary one by being dressed with anti septic gauze & Iodoform. It soon healed up & left no deformity nor permanent impairment of movement of the joint.

Case 4

A. W., the owner and skipper of a fishing smack in the Spring of 1896 while helping to empty a trawl full of fish during the night inadvertently seized hold of a decomposing fish and felt himself pricked by one of its bones in the region of the joint of his Right forefinger (the lower interphalangeal joint) He went on with his work.

Some hours afterwards his finger began to feel painful so after soaking his hand in hot water and finding little or no relief he began to poultice the part with hot linseed poultices.

He obtained no cessation of pain to speak of during the next five days until he arrived in dock.

I was called to his house to see him and attend to the hand.

The finger was swollen quite out of shape - the skin around & in the region of the joint being sodden & in places having an appearance such as is found in cases where a blister has collapsed & partially lost its contents.

The hand was oedematous on the dorsum of the lymphatics of the forearm and upper arm, ^{up to} the glands of the armpit were involved.

I may say that there was movement of the finger joints - though of course with considerable pain. There was nothing special to note concerning the patient's state of health before receiving the injury to the finger.

After well washing in a perchloride of mercury solution (1-2000) I cut with a pair of scissors into the sodden blistered looking skin & turned out a fair quantity of unhealthy looking pus and serum. Then I cut away all the loose skin I could manage to free easily.

This revealed a couple of rather small sinuses from each of which a thread of sloughing tissue presented - and, on using a probe I found they led towards the joint, and bone, which was evidently necrosed.

The pain now was much lessened and I used, ^{in order} to clean the hand & finger, boracic baths & fomentations.

On being advised to do so, permission was given me ^{to patient} to examine the condition of the finger while the patient was under Chloroform, with a view to any necessary operation being done.

This was accomplished, and I found it imperative to amputate the finger at the metatarsophal-

angeal articulation, retaining sufficient of the finger tissues to form a good flap to cover the head of the metatarsal bone, with a view to the preservation of the strength and usefulness of the hand, which is so essential to a fisherman.

The wound healed by first intention.

On cutting into the amputated finger at the injured joint I found the interphalangeal cavity filled with a thick pus - the synovial membrane pulpy and thickened. The articular surfaces of the bones were displaced and the ligaments appeared softened and overstretched. The periosteum of both phalanges was either missing, leaving the bones necrosed, or, further away from the joint, could be very readily stripped off.

The condition showed in fact the usual characteristics of a case of acute periostitis followed by necrosis of the bone.

My reason for choosing to describe the full history of these particular cases is, that each one of the four illustrates a stage in the progress of septic inflammation - and because these stages make a convenient

division into which for the sake of classification most of my cases of poisoning by Fish Sepsis might be placed.

Why one set of cases do not pass beyond the first stage, and why others quickly advance to further stages - is readily understood when one appreciates the nature of the poison and knows the anatomy of the part inoculated.

As to the poisons. - To quote from Crookshank's manual of Bacteriology (p 9173) "Saprogenic or putrefactive bacteria play a most important rôle in the economy of nature. They produce changes allied to fermentation in complex organic substances. Their action on proteids, according to Stoppe-Seyler, may be compared to digestion; bodies like peptones are first produced then they abstract the elements they require, and the remainder enter into new combinations. Associated with the formation of these substances are certain bodies, which have a poisonous effect when introduced into animals. These poisonous alkaloids - *Stomaines* produce a septic poisoning

Walsham in his Theory and Practice of Surgery page 8, in summing up the results of certain

experiments which showed ~~that~~ that these Sapro-
 phytic bacteria rapidly disappeared when
 injected into living tissues - "inferred, from these
 "experiments that the bacteria themselves were
 "incapable of setting up inflammation: that
 "they were only able to thrive in dead animal
 "matter, not in living tissues; & that it was
 "the products of putrefaction," (Ptomaines)
 "of which they are believed to be the cause, that
 "set up the inflammatory process.

From decomposing fish can be cultivated a bacterium
 called ^{the} Bacterium Pflügeri, Ludwig ~~and~~ which pro-
 duces that phosphorescence observed in putrid fish;

(Crookshank M. of bacteriology page 280)

Brieger has isolated ptomaines from putrid fish
 which he calls Saprins

(Crookshank's manual of bacteriology page 280)

From the foregoing it is seen that in order that
 ptomaines be formed Saprophytic bacteria which
 exist in the air & water must have access to dead
 organic matter. In addition there must be suf-
 ficient moisture - "the presence of oxygen and
 "the maintenance of a certain temperature

(Walsham page 8)

Besides these Saprophytic bacteria, other micro organisms capable of living - thriving and multiplying in living tissues are found in most various substances undergoing putrefaction. This was pointed out by Baumgarten (Crockett's 239). These bacteria "exist also in the air & water" and "when introduced by a wound into the living tissues live & multiply and while doing so give rise to irritating products (called *Stomaines*) which set up at first local ^{inflammatory} & then perhaps general poisoning of the body. (Walsham)

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From the cases I have met with and from the histories of those I have described there is no doubt but that the inflammation must have been caused ^{by} the ptomaines of putrefaction brought about by the agency of Saprophytic bacteria; for in no case was there any general septicemia - the inflammation in every one being limited to the primarily inoculated limb. *Pyogenic Organisms?*

As I have tried to show fishermen and fish workers generally are most exposed to the sepsis of putrefying fish, and as I have constantly noticed when, through puncture by a fish bone or fish hook, or maybe through a skin abrasion, inoculation of

Sepsis and microorganisms does take place the inflammatory process is extensive or not, in proportion to the size ^{of depth} of the wound through which the poison enters - and the amount of Sepsis introduced. This is how Saprophytic Bacteriae act.

"The effects of Septic poisoning depend on the dose, whereas the effects of Septic Infection are, to a certain extent independent of the dose.

"A small quantity of a septic poison may produce only transient effects and a relatively large quantity to produce vomiting rigors and death

"Septic infection ~~on the other hand~~ may result on the other hand - Equally from a small dose, because the poison introduced is a living organism capable of propagation and multiplication

(Crookshank's manual page 174)

The position of the wounded part also has an important bearing on the history of the inflammation; and this is easily appreciable when we consider ^{some of} the anatomy of the hand.

On dissecting a finger, or the palm of the hand we find in an average fisherman a very hard thickened cuticle on the under surface, but much finer on the sides and dorsum

The subcutaneous tissue in the front of the fingers ↓ and palm

is very dense, but on the dorsum it is just as lax and without any close adherence to the skin. This state of the subcutaneous tissue accounts for the extreme pain felt in inflamed wounds of the palmar surface of the fingers & hand, and also for the ease with which the back of the hand in such cases becomes puffy & oedematous.

The tendons of the flexor muscles in the fingers run in sheaths. Opposite the interphalangeal articulations the ligaments which invest the surface of the joints are invested by a synovial membrane (Quain's anatomy IX edit. page 163)

The fibrous sheath for the flexor profundus, tendon extends only from the meta carpo-phalangeal joint to be inserted into the base of the last phalanx. The pulp of the first phalanx therefore rests practically upon the periosteum.

"The sheaths of the tendons (flexor) by which they are bound down to the fingers are formed by strong tendinous looking bands of transverse fibres attached to the rough margins of the palmar surfaces of the phalanges. Opposite the joints flexion is allowed by the substitution for these bands of a thin membrane, strengthened by oblique decussating fibres.

(Quain IX edit. page 217)

These few anatomical features ~~it is~~ important to remember when considering the treatment and possible future of a case of septic poisoning of the hand or fingers.

To return to my four specimen Cases:—

In Case I the septic material entered the fingers by small punctures through the more tender skin on the inner side of the right forefinger and the outer side of the little finger.

The patient could not tell where the punctures were, till the erythematous patches appeared. The wounds were insignificant - a very small amount of septic entered the superficial tissue and the case continued a mild case right through.

Case II showed the results of a deeper inoculation - the poison entering by means of a cod hook into the pulp of the finger tip. The pain, owing to the dense tissue, was very great, but was quickly relieved by a timely incision which prevented most likely sloughing of the pulp and necrosis of the tip of the phalanx.

In Case III we find the inflammation in a more advanced stage than in no II

A certain amount of subcutaneous tissue had necrosed. The position of the point of inoculation was probably to the outer and towards the dorsum of the finger midway between the upper and middle joint. A good deal of the puffiness of the dorsum and the lymphangitis being due to this cause, that the lymphatics here ~~being~~ ^{are} more numerous and larger than on the palmar surface.

Case IV

This skipper distinctly knew when he accidentally handled the decomposing fish, and where a bone entered his finger. This was in the region of his ^{2nd} joint. In my opinion the septic matter either entered the joint direct or set up inflammation opposite the joint where as I mentioned before the sheaths are lax and thin.

Greaves in his Surgical applied anatomy page 268 says "It is I believe through this less protected part of the sheath that suppuration without often finds its way into the interior of the sheath."

The sepsis having gained an entrance the pain from the inflammation became extreme owing to the dense resisting structure of the tendon and its sheath not allowing of sufficient expansion.

Then the poison follows the ^{direct course of the} lymphatics which in those situations is "toward the perosteum and the bone" (Macdonald's clinical textbook of surgical diagnosis and treatment.)

With regard to the treatment I follow in cases of septic wounds such as I have described, it varies according to the degree of inflammation, and its after effects, found in each individual case.

In my private practice many of my patients having learnt by experience that any wound received while working among fish - no matter how trivial it appears at the time, may have severe consequences if unattended to - make a point of visiting me for treatment as soon as possible after feeling the prick of the fish bone or fin - or at any rate whenever the first signs of inflammation appear.

It is my invariable custom in these earliest cases, with a sharp scalpel to thin the cuticle, for some distance round about the wound, as much as possible by shaving it off layer by layer. Then in most ^{cases} I am able to find the puncture and after enlarging this with the point of a large Hagedorn needle I allow to run down the blade of the needle into the tissues as deeply as I can

a drop or so of a glycerinated solution of Carbolic acid of a strength equal to 1 in 10.

This I am sure by its antiseptic properties and germicidal action has arrested many a case of what would, if neglected, have progressed into a virulent Septic inflammation.

When erythema has set in I paint all patches, and ^{the} streaks of redness showing involvement of lymphatics, with liq. ferri perchlor. fort. or else the strong tincture of iodine. The former has proved the more valuable of the two in my work so now I use it almost in every case, at the same time keeping the whole limb at rest, on a splint if necessary, and well covered with warm wool - the whole being bandaged with a flannel bandage.

This was my treatment of Case no I.

Very often in Hospital practice we have patients coming for advice who have been treated by local herbalists or chemists. These are the cases which as a rule require operative interference either, in the form of incisions, to let out pus or to snuff a slough to come away; or, when a finger is quite disorganised ~~to remove~~ the useless part by amputation ^{at a place} where the best result can be obtained as regards the future strength of the hand, and its ability to perform its usual

employment. In making simple incisions, bearing in mind the septic nature of the cases, I avoid unnecessarily wounding the tendon sheaths. Out of my list of over 200 cases of wounds inoculated with the Sepsis from fish I can find records of amputation of the finger or fingers in only eighteen, and not one of the whole hand.

The others healed up with more or less stiffness of the joints and some loss of tissue in the region of the wound — the extent of damage depending on the seriousness of the inflammatory processes and the amount of tissue involved. But a large number of cases receive nothing but what I may call "home treatment" and these are the ones we find showing the greatest impairment in the usefulness of their hands.

From a feeling of curiosity and to give me some idea of the number of persons who had suffered from this wound poisoning, I counted, out of sixty fishermen and fish labourers, at least two thirds who could show evidences more or less serious of the results of septic inflammation.

And as to the remedy — prophylactic measures are well nigh impossible — so it seems to me that the best means of relief consist in the early recognition of the inflammatory symptoms followed by the energetic antiseptic treatment of the case by a qualified medical man.

I am convinced from what I know of such cases that if only they could be treated in the earliest stages of the inflammation there would not be that rapid necrosis of the soft and bony tissues which is the constant accompaniment of the later stages and the risk of permanent deformity - and impairment of usefulness of the part injured would be greatly reduced or entirely avoided.

Fines