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The frequent occurrence of structural changes in the organs contained within the head, chest, and abdomen, as a consequence of severe or extensive burns, is a fact familiar to all surgeons; but the precise nature, comparative frequeney, and immediate cause of the different lesions that may occur in these injuries, have not, it appears to me, been, as yet, ascertained with a proper degree of precision, no sufficiently extensive series of observations having been made on this subject. I have, therefore, collected together, and have arranged in a tabular form, for convenience of reference, all those *fatal* cases of burn that I have been able to find a sufficiently implicit account of in different periodicals and works, or that have fallen under my own observation; in all fifty in number. And it is by an analysis of the post-mortem appearances presented by this body of cases, (sufficiently large to avoid the deduction of false inferences,) that I purpose endeavouring to determine the points in question.

Dr. Cumin* was the first, in this country, who pointed out the common occurrence of internal inflammations in cases of burn, to which, he says, his attention had been directed by the symptoms of high arterial action which are frequently witnessed in these injuries. He appears to have been anxious to controvert the then prevailing doctrines of Broussais, as he contends that the mucous membrane of the digestive organs is not affected in the extensive manner that the followers of that physician would lead us to believe, but that, on the contrary, it suffers much less than membranes of the serous class: in this, however, he was in error, as has since been proved by Mr. Long, in a very interesting paper published in this journal.* Dupuytren, in his clinical lectures, shewed, likewise, the frequent complication of burns with internal lesions, such as congestions and inflammations of the organs contained in the head, chest, and abdomen, and related several cases illustrative of this. More recently, Mr. Wallace, of Dublin, has pointed out the same facts, and Mr. Long, in the paper already referred to, gives an analysis of a number of cases of burn, which he had collected from various sources, or that had fallen under his own notice—the most extended series of cases of this description that had as yet been made. To this gentleman is also due the merit of having been the first to point out the occurrence of ulceration of the duodenum, as a consequence of these injuries; on which subject, Mr. Curling* has lately made some very interesting observations, detailing no less that ten cases in which that lesion was found.

In the analysis of the annexed table, I purpose arranging the cases contained therein under three heads: namely, those that died, 1st, during the period of *congestion*: 2nd, during the period of *inflammation*; and 3rd, during the period of *suppuration*.

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*Edinburgh Med. and Surgical Journal, 1823.

*Londod Medical Gazette, Feb. 7, 1840.

† Medico-Chirurgical Transactions, Vol. 7, 2nd Series. I may here mention, that I have not included Mr. Curling's original cases in the annexed table, for as they were *selected*, they would necessarily falsify the result of its analysis.

A TABLE OF THE PATHOLOGICAL APPEARANCES OBSERVED IN FIFTY CASES OF BURN.

me.	Age.	Sex.	Degree of Burn, &c.	Pathological Appearances.			When died.	Source whence obtained.
				Head.	Chest.	Abdomen.		
M. 1	56	Female	2nd degree: upper part of trunk, fore-part of thighs, arms and neck.	Serous fluid in the arachnoid.	Reddish serum in both pleuræ; lungs congested posteriorly.	Bloody serum in peritoneum; spleen congested; stomach congested, especially about middle; ramiform and stratiform redness in small intestines, chiefly ilium.	4thday	University College Hospital.
T. 2	13	Ditto	2d and 3d degrees: face, arms, neck, upper part of trunk.	Membranes and substance of the brain congested; fluid in lateral ventricles.	Lungs much congested posteriorly and inferiorly and hepatized; bronchi inflamed; surface of heart peculiarly congested.	Small intestines healthy, except ilium, which presented marks of ramiform congestion.	4th.	Ditto.
R.	14	Ditto	2d and 3d degrees: right arm, side of chest and back.	Not examined.	Both lungs hepatized with purulent infiltration and congestion of posterior lobes; bronchi contained much frothy mucus.	Abdominal viscera healthy, but blanched.	39th.	Ditto.
A.	5		2d and 3d degrees of left arm hand and thighs.	Vessels of brain turgid; serum at base of skull.	Bloody serum in cavity of right pleura; lungs much congested.	Mucous membrane of stomach pale.	33rd.	Ditto.
L.	8	Ditto	Extensive scald of the chest.	Not examined.	Healthy.	An ulcer, abont the size of shilling, in the duodenum, just beyond the pylorus; the deficiency in the parietes of the gut supplied by the head of the pancreas; small intestine congested in points	10th.	Ditto.
F.	9	Ditto	3d and 4th degrees: front of neck, chest, and arms.	Serous fluid in arachnoid.	Lungs hepatized; bronchial mucous membrane much congested; bronchi contained purulent secretion.	Venæ cavæ greatly distended: patch of ulceration in the stomach nearly cicatrized.	30th.	Ditto.

ame.	Age.	Sex.	Degree of Burn, &c.	Pathological Appearances.			When died.	Source whence obtained.
				Head.	Chest.	Abdomen.		
. G. 7	58	Female	3d and 4th degrees: back, arms, from umbilicus to knees.	Serous fluid in ventricles; some congestion of membranes.	Healthy.	Extensive congestion of the whole of ilium, the mucous coat being of a deep crimson colour.	2d.	University College Hospital.
. D. 8	9	Ditto.	3d degree: right side of neck, chest, trunk, right arm and leg.	Brain much congested; sinuses gorged with blood; bloody serum in ventricles.	Lungs congested.	Healthy.	3d.	Ditto.
. G. 9	3	Ditto.	2d and 3d degree: upper part of chest, face, neck, left arm and hand, right hand slightly.	Healthy.	Purulent deposit in lower lobe of left lung.	Small intestines congested in various parts.	33d.	Ditto.
. M. 10.	8	Ditto.	3d and 4th degrees: upper part of chest, head, and neck.	Not examined.	Recent lymph in pleuræ, and hepatization of substance of both lungs.	Healthy.	3d.	Ditto.
. W. 11	5	Ditto.	1st and 2d degrees: right side of face, neck, chest, and abdomen.	Healthy.	Lower and posterior part of right lung congested and softened; bronchi contained much frothy mucns.	An ulcer in the duodenum about an inch below the pylorus, about the size of a fourpenny-piece, with elevated and thickened edges.	8th.	Ditto.
H. S. 12	4	Ditto.	3d and 4th degrees: arms, upper part of chest and neck.	Great turgescence of veins of surface of the brain; opacity of arachnoid; numerous red spots in interior; great vascularity of plexus choroides.	Both lungs congested posteriorly; bronchi contained frothy mucus.	Congestion of liver; other viscera healthy.	6th.	Ditto.
J. H. 13	25	Ditto.	Whole of trunk, upper extremities, face, and right hip (by explosion of gas), 1st 2d, and 3d degrees.	Surface and substance of brain much congested.	Lungs congested posteriorly, with a few spots of blood effused in their substance.	Portal system much congested, and lower part of small intestines.	4th.	Ditto.
I.A.S. 14	7	Ditto.	3d and 4th degrees: arms, chest, trunk, and thighs to below the knees	Serum in lateral ventricles; congestion of brain.	Lungs congested posteriorly.	Air in cavity of peritoneum; intestines and kidneys congested.	1st.	Ditto.

). R. 15	57	Female	3d and 4th degrees: head, neck, and upper extremities.	Not examined.	Splenization of posterior lobe of right lung and both lobes of left.	Healthy.	4th.	University College Hospital.
?. H. 16	21	Ditto.	3d and 4th degrees: chest, arms, abdomen.	Brain exsanguine; effusion of serum under arachnoid, also in 3d and lateral ventricles.	Healthy, but exsanguine.	Healthy, but ensanguine.	17th.	Ditto.
J. S. 17	1¼	Male	2d and 3d degrees: right side of head & upper part of body.	Brain congested with dark blood; spinal cord contains more fluid than natural.	Healthy.	Healthy.	1st	Ditto.
E. S. 18	18	Female	Whole surface to 4th and 5th degrees.	Congestion of brain; bloody fluid in ventricles and base of brain.	Lungs gorged with dark blood; bronchiæ filled with mucus, and lining membrane engorged; bloody serum in cavities of pleuræ, and in the pericardium.	Bloody serum in peritoneal cavity; mucous membrane of stomach and small intestines congested, and blood extravasated into them; lining membrane of uterus and vagina also congested with recently effused blood.	1st	Ditto.
M. W. 19	3	Ditto.	Severe: upper part of abdomen, lower part of chest, arms, and occiput.	Healthy.	Healthy, with exception of pericardium, which contained fluid.	Lymph in peritoneum gluing together intestines; purulent fluid in peritoneal cavity; ulcer in duodenum about an inch from pyloric orifice; coats of duodenum much thickened with yellow spots; some blood effused about it, with masses of lymph.	7th.	Ditto.
J. B. 20	5	——	Arms, legs, back, epigastriam slightly.	Membranes of brain more vascular than natural, especially velum interpositum and pons varolii.	Lungs sound; purple spots under pleuræ.	Villous coat of stomach: several spots aud stripes, like sloughs, extending deep and black.	2d.	Mr. Swann Edin. Med. Journal, Vol. 19.
A. T. 21	30	Ditto.	Severe burn of head, neck, face, right arm, upper part of chest.	Serum effused between the membranes and into ventricles of brain.	Bronchi much inflamed and full of thick mucus.	Not mentioned.	4th.	Lancet 1823-24.
M. M'C. 22	40	Ditto.	Severe: face, right side of neck, thorax, right arm and shoulder, &c.	Serous effusion on brain; bloody serum in basis cranii.	Hepatization of right lung.	Not mentioned.	14th.	Lancet, Vol. 15.

Name.	Age.	Sex.	Degree of Burn, &e.	Pathological Appearances.			When died.	Source whence obtained.
				Head.	Chest.	Abdomen.		
—— 23	10	——	Face, neck and arms, severe in parts.	Not mentioned.	Lining membrane of trachea acutely inflamed, layer of coagulable lymph on the inner surface; bronchial passages much frothy fluid; lungs congested.	Not mentioned.	7th.	MrThomas, Lancet, 1830.
—— 24	8	Female	Severe and extensive.	Sinuses and vessels of dura mater gorged with blood, as well as those of pia mater and brain; reddish serum in lateral ventricles and at base of cranium.	Lungs congested; right ventricle of heart contained much black blood.	Mucous membrane of stomach and intestines congested.	1st.	Mr. Wallace.
M. Y. 25	8	Ditto.	Severe: neck, left cheek, arm, breast and abdomen.	Not examined.	Adhesions in pleuræ; lungs healthy.	Healthy.	35th.	Mr. Cumin, Edin. Med. Journal, Vol. 19.
J. N. 26	4	Ditto.	Severe, left arm and thigh, hypogastrium and chin.	Pia mater morbidly vascular, with patches of extravasated blood; velum interpositum and plexus choroides congested; bloody serum at base of skull.	Lungs healthy; 2 ounces of serous fluid in pleuræ; a little in pericardium.	Peritoneal coat of intestines inflamed; 3 ounces of serous fluid effused.	5th.	Ditto.
I. S. 27	7	Ditto.	Severe: abdomen, left side of trunk, left cheek, and upper part of both thighs.	Not mentioned.	Not mentioned.	Omentum and peritoneum very vascular, with effused lymph; intussusception of ilium; mucous membrane of intestines exhibited strong marks of inflammation with gangrenous spots.	3d.	Ditto.
. M. 28	7½	Ditto.	2nd and 3d degrees: face, belly, inner sides of both arms.	Healthy.	Red patches in right pleura; mucous membrane of bronchi very vascular.	Peritoneal and mucous coats of small intestines morbidly vascular, with several	9th.	Dttto.

L. M. 29	27	Female	Severe: whole surface.	Not mentioned.	Lungs congested; serum in cavities of pleuræ.	Serum in peritroneal sac, which, as well as intestinal mucous membrane was highly vascular.	2d.	Mr. Cumin, Edin. Med Journal. Vol. 19.
—— 30	40	Ditto.	Severe: face, neck, right side of chest and shoulder.	Serum effused on hemisphere of brain and at base of brain.	Hepatization (?) of right lung.	Not mentioned.	1st.	Wallace.
J. L. 31	5	——	Severe: abdomen.	Not examined.	Not examined.	Healthy.	6th.	Mr. Long.
J. L. 32	28	Female	Severe: arm, chest, and nates.	Not mentioned.	Not mentioned.	Ulcer in duodenum.	8th.	Ditto.
H. B. 33	14	Ditto.	2d degree: nates, back, & both arms.	Not mentioned,	Not mentioned.	Ulcer in duodenum, with marks of peritonitis; mucous membrane of small intestine healthy.	12th.	Ditto.
—— 34	—	— —	Burn of upper part of body: tetanus.	Brain and its membranes dry.	Not mentioned.	Not mentioned.	18th.	Ditto.
—— 35	50	Female	Right side of chest, arm, neck and face.	Not mentioned.	Seven ounces of turbid serum in each side of the chest; lungs congested; bronchial mucous membrane inflamed	Not mentioned.	24th.	Mr. Arnott
L. 36	3	Male	5th and 6th degrees of whole surface.	Membranes of brain preternaturally dry; brain congested and ventricles contain a bloody serosity.	Pleuræ and pericardium dry; congestion of the lungs; redness of mucous membrane of bronchi.	Peritoneum dry; stomach, intestines, and liver congested.	1st.	Dupuytren
—— 37	27	Female	1st to 5th degree of whole surface.	Pia mater strongly injected; arachnoid dry, the cerebral substance firm and dry.	Lungs gorged with blood; bronchi contained much mucosity, their membrane strongly injected.	The pyloric extremity of the stomach presents a numbes of small ulcers with a grayish base; the ilium is of a dark red in the whole of its extent; the liver and spleen are engorged.	2d.	Ditto.
A. F. 38	40	Ditto.	1st to 4th degrees of left side of face, left elbow and side of chest, also of right hand.	Pia mater and brain slightly congested in a punctiform manner.	Not mentioned.	Gastro-intestinal mucous membrane inflamed.	4th.	Ditto.

ame.	Age.	Sex.	Degree of Burn, &c.	Pathological Appearances.			When died.	Source whence obtained.
				Head.	Chest.	Abdomen.		
[. R. 39	33	Male	Severe: of thighs and legs; tetanus.	Veins of cranium distended with blood; arachnoid is opalescent; grey substance of the brain is of a uniform rose colour; the subjacent white substance is also highly injected; the ventricles contain but a very small quantity of serum.	Lungs slightly engorged posteriorly.	Some redness to the extent of 2 square inches, at the great curvature of the stomach; the ilium is of a red colour; also a few spots of redness in the ascending colon.	13th.	Dupuytren
M. 40	63	Female	1st to 3rd degree: on nates and right heel.	Ventricles of brain contain a large quantity of reddish serum; the meninges, especially the arachnoid are inflamed.	Right lung hepatized at the base; the bronchi are injected and filled with mucosities; the right pleura contains a slight effusion.	Mucous membrane of the stomach is very red.	11th.	Ditto.
— 41	17	Ditto.	1st to 4th degree: scald of both feet.	Congestion of the membranes and substance of the brain.	Healthy.	Healthy.	7th. Period of death varied from 4 to 13 hours.	Ditto.
— 42	Ages varied	Ditto.	Not mentioned.	Gorged state of the sinuses of dura mater.	Healthy.	Healthy.		
—	from	Dtto.	Ditto.	Brain congested.	Not examined.	Not examined.		
43	3½	Ditto.	Ditto.	Brain congested; bloody serum in ventricles.	Lungs congested; 5 ounces of turbid serum in right pleura.	Abdominal viscera congested.		Mr. Long.
— 44	to 22 years		Ditto.	Brain congested; bloody serum in ventricles and at base of cranium.	Lungs congested.	Jejunum and ilium were studded with red spots and inflamed.		
— 45								
. C. 46	9	Ditto.	1st to 3rd degree: arms, upper part of chest, shoulders and neck.	Effusion into arachnoid and ventricles; congestion of meninges and of brain, more particularly the cineritious substance.	Right lung somewhat congested posteriorly; not softened or friable; bronchial mucous membrane reddened with frothy mucous; each pleura contained about ½ ounce of bloody serum; pericardium contained some fluid.	An ulcer, about the size of a shilling, was found in the duodenum immediately beyond the pylorus, its margins were sharp, but the mucous membrane, at most, was slightly thickened; lining membrane of duodenum, jejunum, and ilium strongly injected; some fluid in the peritoneum.	4th day.	University College Hospital.

N. 47	18	Female	3d, 4th, & 5th degree of face and upper part of the body.	Not mentioned.	Not mentioned.	Inflammation of the mucous membrane of the duodenum, of the upper part of the ilium, & in patches throughout the small intestines. Serum in the cavity of the peritoneum.	22d.	Ditto.
J. C. 48	4½	Male	1st to 4th degree of whole surface.	Effusion of serum in ventricles of brain and under arachnoid; congestion of cerebral substance.	Healthy.		[1st.	Ditto.
M. G. 49	40	Female	1st to 4th degree of arms, neck, chest and trunk.	Cerebral substance much congested.	Lungs much congested; lining membrane of bronchi congested; covered with frothy fluid.	Mucous membrane of the stomach and intestines congested, with effusion of bloody serum in the peritoneum.	3d.	Ditto.
J. H. 50	21	Ditto.	1st to 3d degree of upper part of body, arms, trunk, legs &c.	Bloody serum in ventricles of brain and under arachnoid.	Not mentioned.	Mucous membrane of intestines congested with bloody serum in peritoneum.	2d.	Ditto.

1st. The period of *congestion* is limited to the first 48 hours; in which death occurs before inflammatory action comes on, or, at all events, is fully established. This is the period that has been denominated, by Dupuytren, that of irritation; and he believed that, in this stage, death might arise from an excess of pain; that "too great a loss of sensibility might kill as well as too great loss of blood." This opinion, however, will, I think, with deference to the very high authority from which it emanated, prove to be entirely unfounded. For when the injury is so extensive or severe as to give rise to such an excessive degree of pain as might be supposed to prove fatal, we shall invariably find that it, at the same time, occasions such structural changes as are fully sufficient of themselves to account for the fatal termination, without having recourse to so hypothetical a notion as death from excess of pain or from loss of sensibility.

On examining the table it will be found that the number of cases contained in this class amounts to 16. Of these, the brain and its membranes were found congested, with more or less serous effusion into the ventricles or arachnoid, in 15 cases.

Contents of cranium not examined in 1
The lungs were congested, with more or less redness of the bronchial membrane, and effusion into the pleuræ, in 8
The lungs were hepatized in . 1
State of the thoracic viscera not mentioned in 2
Thoracic viscera healthy in . . 5
The abdominal organs were healthy in 2
——————not mentioned in 2
——————congested more particularly in the mucous membrane of the stomach and ilium in 12

In one of these last cases there was air in the peritroneum; in four others, there was serum effused, and in one that membrane was dry.

Thus it will be seen that, in all the patients who died during the period of congestion (irritation of Dupuytren), there were found sufficient structural lesions, more particularly of the brain and its membranes, to account for death, without attributing that event to the operation of so obscure a cause as excess of pain or too great a loss of sensibility.

2nd. As the cases contained in the second class, the period of *inflammatory*

re-action and *inflammation*, extend over a longer space of time—from the 2nd day to the end of the 2nd week—they are necessarily more numerous than those of the first class, being 25 in number. Of these,

The state of the brain and its membranes were not mentioned in 8 cases. Of the remaining 17:

There was congestion or evidences of inflammation, with more or less effusion of serous fluid, principally of a bloody character, in . .	11
There was serous effusion only in	3
A healthy condition in	3

The state of the thoracic viscera is not mentioned in six cases. Of the remaining 19:

There was congestion (probably in many instances inflammatory) in the lungs, with more or less effusion of serum or lymph in the pleuræ, with redness of bronchial mucous membrane in	10
Lungs hepatized in	5
Lungs, &c, healthy in	4

The state of the abdominal organs not mentioned in 3 cases: of the remaining 22

There was increased vascularity, chiefly of the mucous membrane of the small intestines, with, in some cases, evidences of peritonitis, in . .	11
Ulcers in the duodenum in . .	6
Abdominal organs healthy in . .	5

Thus it will be seen that the cases in this class differ, in some very important respects, from those in the preceding one. The cerebral lesions are found to be not quite so frequent, but, when they do occur, they present more unequivocal evidences of inflammatory action. The lungs are rather more frequently affected, and show decided marks of pneumonia or of intense bronchitis; as manifested by the former disease having, in several cases, advanced to hepatization, and by the inflamed state of the bronchial mucous membrane, which is usually coated with a thick frothy mucous. Appearances indicative of pleuritis are also by no means uncommon in those cases that prove fatal during this period. The most marked characteristics of it, however, are to be found in the lesions of the abdominal organs, which, although not so frequent as in the stage of congestion, are unquestionably of a far graver nature; that very remarkable and serious of the duodenum, being found in no less than 6 of the 22 cases, or, one of every 3·6 deaths that occur during this period. I may here state that in one instance, Case 46, ulceration of this portion of the intestinal canal was found in a patient who died on the 4th day after the infliction of the injury; the only case on record, I believe, in which this lesion has been noticed at so early a period; Mr. Curling not mentioning, in his collection of cases, any that occurred before the 7th day. Besides the lesion just mentioned, there are abundant evidences of the existence of peritonitis, and of congestion, very probably inflammatory, of the intestinal mucous membrane of those who die during this period

3rd. The cases contained in the third class, those in which death occurred during the period of *suppuration*, are 9 in number; and these we shall also find to be distinguished by several interesting peculiarities.

The brain and its membranes were not examined in 4 cases: of the remaining 5,

There was effusion with congestion in	1
Effusion without congestion in .	2
Preternatural dryness in . . .	1
Healthy condition in	1

State of the thoracic viscera not mentioned in 2 cases: of the remaining 7

There was congestion of the lungs, with effusion into the pleuræ, in	2
Purulent infiltration of the lungs in	2
Hepatization of the lungs in . .	1
Recent lymph effused in pleuræ, in	1
Lungs healthy, but exsanguine, in	1

The condition of the abdominal viscera uot mentioned in 2 cases. Of the remaining 7,

Inflammation of duodenum and congestion of ilium in	1
Congestion of ilium in	1
Cicatrized ulcer in stomach: otherwise healthy, in	1
Healthy in	4

Thus it will be seen that in the 3rd class of cases, lesions of the lungs are the most common; of the brain least; whilst those of its abdominal viscera are but of unfrequent occurrence.

Of the six cases in which morbid changes were found in the lungs or pleuræ, one died on the 24th day, and the remaining five between the 30th and 39th days. The pneumonia will,

advanced stage, having, out of the five cases in which it occurred, gone on to purulent infiltration in two, and to hepatization in one. There is one case of peculiar interest in this class: viz. that in which a recently cicatrized ulcer was found in the stomach; which lesion must, like the duodenal ulcers, have occurred during the second period; the patient dying in the third, of pneumonia and bronchitis.

Thus then it will be found, that of the cases that occurred during the 1st period:

The cerebral organs were diseased in	15	out of 15	or 100 per cent.
The abdominal organs in . . .	12	,, 14	,, 85·7 ,,
The thoracic viscera in . . .	9	,, 14	,, 64·2 ,,

In the second period, the comparative ratio is, as nearly as possible, the same; if anything, the cerebral organs are a little more frequently affected:

The brain and its membranes being diseased in	14	out of 17	or 82·3 per cent.
The thoracic viscera in . . .	15	,, 19	,, 78·9 ,,
The abdominal organs in . . .	17	,, 22	,, 77·2 ,,

In the third period:

The thoracic viscera were diseased in	6	out of 7	or 8·57 per cent.
The cerebral organs in . . .	4	,, 5	,, 80 ,,
The abdominal viscera in . .	2	,, 6	,, 33·3 ,,

On taking the total amount of the whole of the cases, and reducing it to decimals, it will be found that:

The cerebral organs were diseased in	33	out of 37	or 89·1 per cent.
The thoracic viscera in . . .	30	,, 40	,, 75· ,,
The abdominal viscera in . .	31	,, 42	,, 73·8 ,,

The period at which death may be expected to occur varies, necessarily very considerably, according to the nature of the individual case, the extent or severity of the burn, and the age or constitution of the patient. On taking, however, the aggregate of the 50 cases, without reference to these modifying circumstances, we shall find that 33, or 66· per cent, prove fatal during the first week. Of these 33, no less than 27 died during the first four days, and the remaining six on the three following days. Of the 17 that were left:

8 died during the	2nd week.
2 ,,	3rd do.
2 died during the	4th week.
4 ,,	5th do.
1 ,,	6th do.

Thus it will be seen that the greatest number of deaths occur during the first few days, in the stage of congestion, or whilst that condition is passing into an inflammatory one. After this period the mortality diminishes progressively until the 5th week, the period of suppuration, when the chief dangers to be apprehended arise from exhaustion, purulent infiltration of the lungs, and inflammation of those organs.

The relative frequency with which different organs are affected at different ages, varies somewhat though but to a very trifling degree. On dividing the whole of the cases into two classes, those which occur below the age of puberty or 14 years, and those which occur above that age, it will be found that 29 cases fall into the first division, and 20 in the second; the age not being mentioned in one.

Of the 29 cases, or those that occurred below the age of puberty,

The brain and its membranes were not examined in	8	
They were healthy in	4	
——— diseased in	17	or 80·9 per cent.
The thoracic viscera were not examined in . .	5	
——— healthy in	6	
——— diseased in . . .	18	or 78·2 per cent.
The abdominal viscera were not examined in . .	2	
——— healthy in	6	
——— diseased in . . .	21	or 77·7 per cent.

Of the 20 cases that occur above the age of fourteen:—

The brain and its membranes were not examined in .	5	
——— ——— healthy in . .	0	
——— ——— diseased in . .	15	or 100 per cent.

The thoracic viscera were not examined in	3
——— healthy in	3
——— diseased in	14 or 82·3 per cent.
The abdominal viscera were diseased in	13 or 81·2 per cent.
——— healthy in	3
——— not examined in	4

On examining the structural changes that we meet with in internal organs and tissues, more particularly the mucous membranes, in cases of burns, we are struck with some remarkable points of resemblance between the effects of these injuries and the consequences of some of the eruptive febrile diseases, such as small-pox, measles, scarlatina, and erysipelas, in which the functions of the skin, as an eliminating organ, are more or less extensively suspended. In these affections nothing is more common, than to meet, during life, with symptoms of inflammation or of congestion of internal organs and tissues, especially of the gastro pulmonary mucous membrane, of the brain, lungs, pharynx, bronchi, and bowels, which are indeed the expected and almost constant accompaniments of, and chief causes of danger in the diseases just mentioned. The severity also of these complications is most generally increased on the full appearance of the cutaneous eruption. This is particularly seen in small-pox, in which disease the secondary fever and its consequences, such as ptyalism, lachrymation, bronchial cough or diarrhœa, are always most intense at the period when the functions of the skin must be almost, if not entirely, suspended by the full and free evolution of the pustules. The after-death appearances presented by the eruptive febrile diseases likewise closely resemble those that are met with in fatal cases of burns. In both these instances. as has already been proved with regard to burns, and as is well known with respect to the affections just mentioned, nothing is more common than to find the mucous membrane of the stomach and bowels congested or inflamed, the follicles being enlarged and prominent; together with evidences of meningitis, whether consisting in the deposition of lymph or the effusion of serum, with more or less congestion of the cerebral substance. Inflammation of the bronchial mucous membrane is also of very frequent occurrence, and inflammatory congestion of the tissue of the lungs in its different stages is by no means rarely met with. Thus, then, the lesions that occur as a eases are very similar, in many respects, to those that are found in fatal cases of burn.

The causes that have usually been assigned for the frequent (if not constant) complication of severe burns with congestions and inflammations of internal organs and tissues, are, either a repercussion of the blood from the surface to the central organs, or else a sympathetic connection between the skin and these organs snd tissues.

With regard to the first of these, repercussion of the blood from the surface to the central organs of the body, we shall find that it cannot exist as a permanent effect of burns; for in these injuries the integuments, (unless they be destroyed in their whole thickness), actually contain more blood than natural. This is proved by the reddened and inflamed condition of the true skin, and by the swelling of the subcutaneous cellular membrane; so that in reality, as soon as the immediate shock of the accident is over, the internal organs ought to contain less blood than natural, the application of heat to the skin acting as a derivative, were it not for the operation of another set of causes that will presently be adverted to.

That a sympathetic connectisn exists between different tissues, and between individual tissues and entire organs, in their morbid actions, is an established fact; but it is no less certain, that the word "sympathy" is too often used in a loose and vague sense to account for consecutive phenomena of disease, the cause of which may be explainsd more correctly in other ways.

It has been proved by the experiments of Ducroz, and of Breschet and Becquerel, that if the skin of a rabbit be coated over with gum-lac, or a mixture of resin and suet, the animal soon dies from suppression of the cutaneous perspiration, with symptoms of derangement of the functions of the brain or lungs. We should, therefore, expect that in burns, and those diseases, such as the eruptive fevers already mentioned, in which secretion is at once arrested over a large extent of the surface of the skin, a condition of the system analogous to that produced in the experiments referred

Now cutaneous transpiration being suddenly and completely arrested over the whole of that portion of the surface of the body that has been exposed to and injured by the action of the fire, it does not appear at all improbable that a compensating secretion, as it were, should be attempted to be set up from the mucous membranes, more particularly the gastro-pulmonary, (which is the most extensive, as well as the one that seems most intimately connected, both anatomically and pathologically, with the skin), in order to relieve the system from the accumulation of that large quantity of fluid which is, in a healthy condition of that tissue, eliminated by the skin; and which in burns does certainly not pass off by the kidneys, the urine not being perceptibly increased in quantity, or, I believe, altered in quality. Mr. Curling, in his very interesting paper on Ulceration of the Duodenum consequent upon Burns, published in the Medico-Chirurgical Transactions for the present year, accounts for the very frequent occurrence of this lesion, by supposing that Brünner's glands endeavour "by an increased action to compensate for the suppression of the exhalation of the skin, and that the irritation consequent thereon often leads to inflammation and ulceration." This appears to me a highly probable supposition, and is indeed the only way by which we can explain the occurrence of ulceration confined to the duodenum. At the same time, however, I think that we are justified in extending this explanation; and that we must account for the occurrence of a general congestion of the gastro-pulmonary mucous surfaces, not so much by any repercussion of the fluids, which, as has already been stated, does not take place as a permanent effect, (the cutaneous textures actually being in a state of inflammatory congestion, and thus containing, especially when the burn is superficial, more blood than natural), as by the additional influx of blood, which is the necessary consequence of an increase in the activity of the secernent and exhalant functions of this as of all other mucous membranes, and which is increased by the accumulation in the system of that fluid which ought to pass off by the skin.

When we consider that the average quantity of the cutaneous secretion amounts, in a healthy adult, to eleven grains in the minute, or to between two and three pounds in the twenty four hours (Seguin), we cannot suppose that this secretion should be suddenly arrested to the extent of one-half, or even more, as it necessarily must be, when a corresponding portion of the skin is injured by the action of caloric, without its being absolutely necessary that one of two things should happen; either that an antagonistic secretion, to a correspouding amount, be set up from some other tissue or organ, or else that a degree of plethoric distension of the whole vascular system, giving rise to congestions of internal organs and membranes, and effusion into serous cavities, take place. Now the first does certainly not occur in most cases of burns te a sufficient extent. We do not, in these injuries, find the urinary secretion increased in quantity; and although the mucous membrane of the intestines does, perhaps, in many cases, attempt to relieve the system by an increased secretion—perhaps, as Mr. Curling has suggested, from Brünner's glands, giving rise to liquid stools—yet this is not to an amount sufficient to maintain the proper balance of the circulating fluids. The second consequence must, therefore, result; the system becomes hyperemic, congestions ensue in the mucous membranes, partly from the condition that is common to all the tissues, and partly from the increased afflux of blood that is always attendant upon increased functional activity of a part. The brain and lungs, as well as the other large organs, occasionally become engorged, effusion of a more or less bloody fluid takes place into the different serous sacs, the arachnoid amongst the rest, and death ensues from causes that are themselves the immediate effects of suppression of the natural secretion of the skin. By this means we may account for the occurrence of death in the earlier period of burns, before there has been time for inflammation to be lighted up, and also for the fatality of those injuries of this nature that are extensive but superficial—burns of the first and second degrees—in which cases the functions of the part of the skin injured are entirely and suddenly arrested.

These remarks on the effect of the suppression of the cutaneous secretions do not apply merely to cases of burn, but also to all those diseases of the skin in which the functions of the tissue are more or less perfectly suspended. We have already seen that the morbid appearances found after death in fatal cases of the eruptive fevers closely resemble those produced by burns. Now, may not these be originally attributable to the operation of the same cause? With the exception

however, of those cases in which the disease has invaded internal organs by metastasis, or in which the morbid actions have extended themselves by continuity of tissue, both of which are of comparatively rare occurrence, and cannot interfere with the general rule that secondary visceral diseases are in burns, and most generally in eruptive fevers, the result of arrest of the functions of the skin, and of consequent retention in the system of the perspirable matter.

May not also the deranged condition of the digestive organs and liver, which is so commonly met with in chronic cases of disease of the skin, as in eczema, impetigo, lepra, psoriasis, &c. be in reality, in many instances, the effect of diminished functional activity of this tissue, rather than the cause of the disease in question—the consequence, and not the cause, as it is generally supposed to be, of the cutaneous affection? If this, which can only be ascertained by a long series of carefully-conducted observations, should prove to be the case, how materially will it not change the received opinions as to the etiology of, and the present mode of treatment adopted in many of these complaints?

The practical bearing of the facts that have been mentioned in the first part of this paper, on the constitutional treatment of burns, is sufficiently obvious. If, as has been stated, the immediate cause of the occurrence of internal congestions and consecutive inflammations be the suppression of the cutaneous transpiration to a greater or less extent, and consequent retention in the system of a large quantity of fluid that ought to pass off by the skin, we should, in order to prevent the supervention of these secondary diseases, endeavour to set up such a drain on the system as would, as rapidly as possible, compensate for the arrest of the secretions of that tissue, and have a tendency to restore the balance of the circulation, disturbed by the accumulation of an unusual quantity of fluid in the system. This may either be affected by the employment of diuretics, so as to induce an increased action of the kidneys—by guarded blood-letting, carried to such a length as the powers of the patient would allow—or, else (what would be better, if time and the nature of the case would admit of it) by encouraging the process of suppuration as quickly as possible. It is a question whether diuretics or blood-letting might not be of gestions in extensive *superficial* burns, in which the suppurative process would probably, not be established; the injury not being sufficiently deep for that purpose. On the other hand, when the burn extends to a greater depth, if there be no immediate occasion for the loss of blood, from the actual occurrence of visceral mischief, the process of suppuration should be hastened and maintained, consistently with the powers of the patient, as a useful drain, and as, perhaps, the best mode of relieving the system from the pressure of the fluid retained within it.

As it has been shewn that the brain and its membranes are the parts that are most frequently affected by congestion and consecutive inflammation in cases of burn, we should, more particularly during the earlier stages of these injuries, when the complications referred to are most to be dreaded, watch carefully for the occurrence of any cerebral symptoms, however slight, and be most active in our measures whenever any of these shew themselves, as the progress of the inflammatory congestion and effusion is usually so rapid in its course, when once set up, that no time should be lost if we want to save the patient. That this may often be accomplished by prompt venesection or leeching, and the usual treatment adopted in encephalitis, there can be no doubt. A case in point occurred about four years ago, under Mr. Samuel Cooper, at University College Hospital in a child named Jane Elbel, six years of age, who was admitted for an extensive burn, to the first, second, and third degrees, of the upper part of the trunk, arms and face. Symptoms of encephalitis, followed by violent convulsions, and complicated with an extensive bronchitis, set in a few days after admission: for these she was bled twice in the jugular vein, and treated in an active antiphlogistic manner, and notwithstanding the extensive injury for which she was admitted, and the serious nature of the affections with which it was complicated, she recovered perfectly, although there can be little doubt that had less energetic and prompt measures been had recourse to, a fatal result would have occurred. A somewhat similar case is reported in the Lancet, by Mr. Thomas: it occurred at the Middlesex Hospital.

Next to the brain and its membranes, the lungs should claim our special attention, both on account of the frequency

ary inflammations of those organs; which, although of not quite so common occurrence as lesions of the encephalon, are yet, in all probability, more frequently the cause of death, being usually of a graver nature. It behoves us especially to be on our guard whenever any appearances, however trifling, of oppression in the breathing, or, of the blood not being duly aerated in its passage through the lungs, are observed. In these cases we must not wait for the unequivocal signs of active sthenic, idiopathic pneumonia, or bronchitis, to shew themselves, as the symptoms of these diseases are, in burns, as in all other severe injuries, necessarily masked or rendered latent by the general disturbance of the system; but we must at once, on the supervention of the above-mentioned symptoms, proceed to the examination of the chest; and, if we encounter the usual signs of pneumonia, such as dulness on percussion, muco-crepitant or crepitant rhonchus, or total absence of all rhonchus with bronchophony, as active a mode of treatment as the circumstances of the individual case will admit of must be had recourse to. And if the views that have been advanced with regard to the cause of these secondary visceral diseases be correct, they would warrant us in the adoption of bolder depletory measures than are usually had recourse to in similar cases; although we must carefully bear in mind the necessity of not reducing the patient's strength below a certain point, as he would have, in severe burns, the stage of suppuration to pass through, in which a great call is made upon the powers of the system.

Although I believe that, of the two dangers—the chance of a fatal termination occurring from inactive treatment in the early stages of visceral inflammation, consecutive on burns, or, from too great a depression of the powers of the system at a more advanced period from too energetic depletory measures—the first is the most to be apprehended, as it is much easier to build up the strength, though much reduced, than to check the course of inflammation, particularly of the brain and lungs, without due depletion; yet this can only be had recourse to in the earlier periods of the injury. For it would clearly be impossible to employ active measures of this kind in cerebral inflammation, or in pneumonia occurring during the more advanced stages of burn, when the system has already been greatly lowered by irrita-

With regard to the abdominal viscera, although congestions of them are very common, yet they probably would not of themselves prove fatal, were it not for the occurrence of perforated ulcer of the duodenum, which as has been already stated, was found in one out of every 3·6 cases of death that occurred during the second period.

Mr. Curling, in the paper already referred to, recommends that, in those cases in which there is good reason to suspect ulceration of the duodenum, there being pain on pressure in the right hypochondrium, together with uneasy digestion, and perhaps bloody vomiting and stools, we should have recourse to the application of leeches to the part, (if it be not injured by the burn,) to small doses of hydrargyrum cum creta, and to the mildest nourishment.

This plan of treatment may probably be effective in arresting the disease, if it be employed in the earlier stages, but if the ulceration has advanced to such an entent as to occasion bloody vomiting or stools, our prognosis must be very unfavourable, although not necessarily hopeless, as Mr. Curling states that there is a preparation in the London Hospital of a cicatrized ulcer of this part of the intestinal canal, that was taken from a patient who died of exhaustion eight weeks after the infliction of the burn. And in the table appended to this paper is mentioned a somewhat similar case—a patient having died of pneumonia, on the 30th day after the accident, in which a recently cicatrized ulcer was found near the pyloric end of the stomach.

Hæmatemesis and bloody stools also occasionally occur in patients suffering from severe burns, without death ensuing; probably, in the majority, at least, of these cases, the bleeding takes place from the congested mucous membrane, and not from any ulceration in the duodenum, intestines or stomach.

As my only object in speaking at all of the constitutional treatment of burns has been to point out the necessity of attacking the consecutive visceral inflammations energetically, a point which, it appears to me, is not universally recognized—I shall abstain from making any remarks on the treatment of the suppurative stage of these injuries, or on that of hectic or exhaustation; as the principles that should guide us in these are laid down in most systematic works, and are familiar to all Surgeons.

may be stated that the first object should be to relieve the system of the abnormal quantity of fluid that must have accumulated in it in consequence of the arrest, to a greater or less extent, of so important a secretion as the perspiration. This may be accomplished either by the administration of diuretics, by guarded blood-letting, or, by encouraging the process of suppuration, if it be deemed prudent to wait until this be established. Secondly, that any appearance, however slight, of the supervention of inflammation in the organs contained within the head, chest, or abdomen, should be watched with the utmost anxiety, and treated, if it do occur, as actively as the circumstances of the case will admit. And thirdly, that the process of suppuration should be maintained or arrested with a due regard to the state of internal organs, and the condition of the powers of the system.

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