ON THE RELATIVE DANGER TO LIFE FROM LIMB-AMPUTATIONS,

IN ST. BARTHOLOMEW'S HOSPITAL, LONDON, AND IN
COUNTRY PRACTICE.

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IN consequence of my absence on the Continent, I have been hitherto unable to reply to a communication "On Hospitalism", inserted in this JOURNAL for March 27th, by Mr. Holmes Coote, the eminent and well-known lecturer on surgery at St. Bartholomew's Hospital, London.

In some observations published two or three months ago, I stated that, using with other statistical inquirers the four major amputations of the limbs—viz., amputation of the thigh, leg, arm and forearm—as tests of the comparative success of surgery or surgical operations under different conditions—I had found that these four amputations were fatal in private country and provincial practice in the proportion of about 1 in every 9 cases operated on, while the same amputations were fatal in large and metropolitan hospitals in about 1 in every 3 cases operated on. These operations, therefore—and proportionally all others—were, I inferred, three times as dangerous in the wards of large and metropolitan hospitals as in private rural practice.

Mr. Coote primarily objects to my classifying the large and metropolitan hospitals "all together, and giving one general death-rate for the whole." In consequence, he appeals to the results of the operations performed in his own hospital of St. Bartholomew's alone. I am perfectly willing to take St. Bartholomew's in this way as a standard, believing, as I sincerely do, that it is one of the very best and healthiest of the large hospitals in the metropolis, and has attached to it now—as in past history it has long had—a staff of the most distinguished and able surgeons in Great Britain. What, then, is the mortality accompanying surgical operations in this great hospital?

I.—Can the Mortality after ALL the Registered Surgical Operations in St. Bartholomew's Hospital be correctly compared with the Mortality after Limb-Amputations?

In the *Edinburgh Medical Journal* for March 1869, I have published the results of 2,098 amputations of the thigh, leg, arm, and forearm in private rural practice in Scotland and England. Out of these 2,098 major amputations, 227 ended fatally, or 1 in every 9.2 died, or 10.8 in every 100.

"In St. Bartholomew's hospital (writes Mr. Coote), 2,131 registered operations have been performed during the years 1863-7, with 277 deaths, equal to a percentage of deaths of 12.99, or 1 in about $7\frac{1}{2}$; and this is (he adds) about the same as Sir James Simpson's death-rate, after 'limb-amputations' in rural practice, which he puts at the favourable figure of 1 in 9."

But in making such a comparison between the mortality after the four "major amputations" of the limbs and the mortality after all the registered operations—great and small—in an hospital, Mr. Coote proposes to compare factors and data that are altogether incomparable. It is a comparison of things incompatible and incongruous, as I am sure every statistician will hold. Among the 2,131 registered operations at St. Bartholomew's during these four years, are entered, for example, 185 amputations of the fingers and toes, with 3 deaths; 216 cases of excision of benign tumours, with 5 deaths; 71 cases of hydrocele and hæmatocele, with 1 death; 63 cases of fistula, with 2 deaths; 30 cases of circumcision, with no deaths; 105 cases of tenotomy, with no deaths; 16 cases of ligature of hæmorrhoids and 22 of nævi, with no deaths; 14 cases of operation for ectropion and 18 extractions of the lens for cataract, with no deaths, etc. To adduce these and various other relatively safe operations as, in their risk and mortality, in any way comparable with the risk and mortality attendant upon the four major amputations of the limbs, appears to me utterly irrelevant and beside the question. To shew the relative safety of these and of the divers other operations of surgery in a large hospital like St. Bartholomew's, and their safety in country private practice, we should require for comparison—what we have not—a similar series of the same operations and their results as

observed in the hands of rural practitioners. We possess, however, ample and reliable data for the requisite comparison in limb-amputations as performed by the surgeons of St. Bartholomew's Hospital and as performed by rural surgeons in country houses, cottages, and hovels. Let us turn, then, to these limb-amputations in search of the only data which as yet exist on this important matter.

II.—Mortality after Amputations of the Thigh, Leg, Arm, and Forearm, in St. Bartholomew's Hospital and in Rural Practice.

Mr. Coote gives, in his computations, the number of amputations of the limbs in St. Bartholomew's from 1863 to 1867 as amounting, on the whole, to 217, with 78 deaths. Their exact number, as published in the excellent statistical tables of the hospital, drawn up officially by Dr. Southey and Mr. Mallett, was 214 cases, with 81 deaths. The total mortality, therefore, after the four major amputations in these five years at St. Bartholomew's, was 37.8 in the 100; or 1 in every 2.6 operated upon died.

On the contrary, in the 2,098 similar amputations collected by me from private rural practice, the mortality was 10.8 in every 100; or 1 in every 9.2 operated upon died.

These four amputations, therefore, proved *three and a half times as fatal* to the patients in St. Bartholomew's Hospital as in rural private practice—a startling and astounding difference.

But, argues Mr. Coote, "one of the great sources," to use his own words, "of the high rate of mortality after limb-amputation is drawn from the statistics of amputation of the Thigh—an operation," he adds, "rarely performed in private practice, and not often, I think, in the agricultural districts."

The proportion, however, of traumatic thigh-amputations, as compared with other limb-amputations, is smaller in Bartholomew's (where it formed 1 in every 9 of the major amputations) than it is in the statistics of rural practice which I have collected, and where it formed 1 in every 7 of the major amputations. From 1863 to 1867—the years referred to by Mr. Coote—24 amputations of the thigh, for injuries or their results, took place in St. Bartholomew's. One rural surgeon whose cases I have reported—Mr. Davis of Aberdare—has in his own individual practice performed amputation of the thigh for injuries in 22 instances, or in nearly as great a number of cases as occurred altogether in St. Bartholomew's from 1863 to 1867. Another—Dr. Canney of Bishop Auckland—has performed with his own hands 20 primary amputations of the thigh; and so on. Out of 313 cases, in all collected by me from the country, in which amputation of the thigh was performed for injury or its consequences, 25 in the 100 died. In St. Bartholomew's, 58 in the 100 died under the same operation.

In Mr. Coote's communication, it is stated that, at St. Bartholomew's Hospital, the mortality from all the thigh-amputations for injury or disease was 1 in 2.7. It was higher, and amounted to 1 in 2.2; 44 having died out of 95 operated upon. Out of all the thigh-amputations in country practice collated by me, 124 died; or 1 in every 5.4; or 18 per cent; while in St. Bartholomew's the mortality was 46.2 per cent.

It is not, however, as Mr. Coote thinks, in such great and formidable operations as amputation of the thigh that the difference is most remarkably shown between the peril and fatality of surgery in metropolitan hospitals and in rural practice. The dangers of hospitalism appear far more in minor amputations. Thus, for example, in amputation of the Forearm, for either injury or disease, the difference is still more strikingly pronounced. In St. Bartholomew's Hospital, out of 25 amputations of the forearm, 2 died, or 1 in 12; out of 377 amputations of the forearm collected by me from rural practice, 2 died, or 1 in 188. The mortality from amputation of the forearm was, therefore, *fifteen times as great* in St. Bartholomew's as in private rural practice. This same simple amputation of the forearm is even more fatal in various other hospitals than it is in St. Bartholomew's, showing that it is not any alleged magnitude of previous shock, nor the gravity of an operation, etc., that will account for the enormous differences between the results of surgery in large and metropolitan hospitals and in country domiciles and dwellings.

Mr. Coote adduces also the mortality in St. Bartholomew's Hospital attendant upon amputations of the leg and arm for disease and injury. He gives the number of amputations of the arm for injury as 19, with 4 deaths; and the number of cases of amputation for disease as 13 (instead of 12). The mortality attendant upon arm-amputations in St. Bartholomew's was, therefore, about 1 in 8. In 433 country amputations of the arm, the mortality was about 1 in 23, or nearly three times less. Mr. Coote cites the number of cases of amputation of the leg at St. Bartholomew's for injury as 31, with 15 deaths. The numbers, however, amounted to 33, with 17 deaths. The leg-amputations for disease were 34, with 13 deaths. And the whole mortality in leg-am-

putations was thus 1 in 2.3, instead of 1 in 2.9, as he states it. In country practice, out of 618 legs amputated, 81 died, or 1 in 7; or the mortality was between three and four times less in rural practice than in the practice of St. Bartholomew's Hospital.

III.—*The Surplus of Deaths after the Four Major Amputations of the Limbs in the Practice of St. Bartholomew's Hospital, compared with Rural Private Practice.*

The number of patients who died after limb-amputation in St. Bartholomew's from 1863-68 was, as we have seen, 81 out of 214 operated upon. But, according to the statistics of rural practice which I have collected, out of every 214 operated upon only 23 died.

Therefore, the SURPLUS of mortality in large hospitals, as compared with rural practice, in private habitations, and cottages, is thus 58 out of 214 operations; a difference at first sight so incredible, and involving such an appalling sacrifice of human life as to appear to me to call on all of us loudly and earnestly for the most anxious inquiry and rectification. I make this remark under the belief that this excess of mortality is mainly if not entirely traceable to hospitalism and its effects. Can Mr. Coote suggest any other rational cause or causes to account for the tremendous difference in the results?

Or let us state the problem otherwise. Out of 2,098 limb-amputations collected by me—performed in country and provincial private practice, and chiefly in the homes and cottages of the poor—227 died. But, according to the statistics of St. Bartholomew's Hospital, if these 2,098 amputations had been performed upon patients within its walls, 794 lives would have been lost among those subjected to operation, instead of only 227; or in this given quantity of limb-amputations the hospital surgeons in their practice would have a SURPLUS or excess of 567 deaths greater than the rural surgeons would have met with if they had been the operators in the same number of cases.

Mr. Coote owns that my statements respecting the high rate of mortality in large or in Metropolitan hospitals is sufficiently important to "demand either an answer, or else some change in our hospital system". I submit that Mr. Coote's first alternative has failed entirely; and I quite agree with him as the second alternative, viz., the necessity of "some change in our hospital system." If, for example, the 214 patients who were subject to limb-amputations in St. Bartholomew's, from 1863-68, had been all sent out of the rich palatial hospital in which they were placed, into villages or cottages—and perhaps from the city into the country—50 of their lives would, I believe, have probably been saved. But even if the 25, or one half only, of these human beings were preserved by such a change, are we not, by every principle of humanity and sympathy, bound to try to effect it? For our hospitals should not be charities merely in name, but charities in truth and reality.

Mr. Coote holds that there is a necessity for us to "aggregate our sick poor in large hospitals." Most assuredly there is no such necessity; and whenever the painful peril and needless sacrifice of human health and life connected with our present hospital system are sufficiently impressed upon the mind of the public and of the profession, the system itself will be altered; and that without any great difficulty. It seems to be Mr. Coote's opinion that small or detached hospitals are attended with diverse inconveniences. Latterly, in America, some hospitals, much larger than any in London, have been constructed upon the cottage or village and single-story principle, with the administrative, cooking, and other departments in their centre; and—without discussing for the present the question of their great salubrity—they are averred to be cheaper in their original construction (as there are no strong foundations and heavy supporting walls required); cheaper in their administration (as there are no higher flats to mount and carry up to); and far better ventilated, as single-storied buildings confessedly are. Besides, such hospital-forms and buildings seem to save expenditure by shortening the duration of the hospital residence of the inmates; the poor patients recovering more rapidly and steadily in them; for, instead of being continually imprisoned, as it were, in their bed-rooms or wards, they can, during their convalescence, always easily reach the ground and open air without the dire necessity of descending and again ascending weary and repulsive flights of stairs.

ARREST OF HÆMORRHAGE FOLLOWING EXTRACTION OF TEETH.—S. Lawrence, of Lowell, Massachusetts (*New York Medical Record*) usually applies persulphate of iron in excessive bleeding; and, if that do not prove successful, a piece of lint or cotton is spread out, and as much of dry plaster of Paris as will go into the cavity is placed on the cotton, so as to make a ball or pellet, which is forced into the alveolus with a blunt instrument. The finger or thumb is then placed upon it until the plaster sets and the cavity is hermetically sealed.

ON THE "MUSCULAR SENSE", AND ON THE PHYSIOLOGY OF THINKING.

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WE think or reason principally by means of Language. We may ask, then, whether, in using language as a vehicle for thought, words recur or are revived primarily as ideas of sound, or as revived remembrances of articulatory efforts? Are they ever, in fact, primarily revived as "suppressed articulations"?

In opening this inquiry, I start with the presumption (1) that, in the higher phenomena of mind, which are dependent upon the cerebral hemispheres, certain definite parts of these are always called into activity whenever similar mental operations are repeated; so that the evolution of particular states of consciousness is always dependent upon the activity of the brain in a certain definite though unknown manner. We could scarcely imagine it to be otherwise: in all the higher organisms, each individual part has its definite function. And just as in the lower nerve-centres we know that certain issuing and entering fibres transmit definite motory or sensory stimuli, so, in centres of greater complexity, where there is all the more need for uniformity, it is only fair to expect that the same uniformity does exist. That optical impressions do pass along definite routes to certain parts of the cerebral hemispheres, that auditory and olfactory impressions also pass along definite though independent routes to the cortical grey substance, we have a right to expect, from what we know of the physiology of the nervous system.

2. Then it is assumed that, when past impressions are revived as ideas or recollections, precisely the same parts of the hemispheres, the same nerve-fibres, and the same nerve-cells, must be called into activity as were previously concerned in the perception of the original impression.

3. I also assume that the several sense-centres, at the base of the brain and in the medulla, are connected in a perfectly definite way, each with its own set of cells in the cortical substance of the hemispheres; these cells, in connexion with the several sense-centres, constituting their respective *perceptive centres*, which may exist in regions of the hemispheres either distinct from one another, or which may be variously interblended. In the perceptive centres: the primary impressions made upon the organs of sense are converted into "perceptions" proper; that is to say, they receive their intellectual elaboration, and this elaboration implies an intimate cell and fibre communication between each perceptive centre and every other perceptive centre; since one of the principal features of a perceptive act is, that it tends to associate as it were into one state of consciousness much of the knowledge which has been derived at different times and in different ways concerning any particular object of perception. An impression of an object, therefore, made upon any single sense-centre, on reaching the cerebral hemispheres, though it strikes first upon the perceptive centre corresponding, immediately radiates to other perceptive centres, there to strike upon functionally related cells; all this taking place with such rapidity, that the several excitations are practically simultaneous, so that the combined effects are fused into one single perceptive act. Thus, I see an orange at a distance: this, as an object of visual sense, is simply a rounded yellow area; but past experience has led me to know what are the tactual and muscular sensations usually associated with the sight-impressions—how it is really a spherical body, with a somewhat rough surface. Then I have learned also that these impressions are usually associated with a certain odour, with a certain taste, a certain succulence, and certain internal optical characters, including a divisibility into segments, and the possible presence of seeds within. A combination of any of these, or of a host of other revivable impressions, may go to constitute my perception of an orange, and may flash into consciousness, more or less simultaneously, on the presentation of the object to the visual sense.

4. Then it must be understood also that, in any process of thought, when the cerebral hemispheres are once in action, very many of the phenomena giving rise to the successive stages of the process of thought do go on more or less automatically, by virtue of preexisting associations of contiguity, resemblance, etc., which have probably served to establish definite nerve-connections or channels of communication between the several parts concerned. But, independently of this automatic sequence taking place by virtue of an unconscious but organised memory, we can exercise also, at will, a still more mysterious function—that of voluntary *recollection*. By the exercise of this function, we have