

POST-OPERATIVE PSYCHOSES

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THE term "post-operative psychosis" refers to mental illnesses which follow in the wake of surgical operations. These conditions have received relatively little attention from psychiatrists. The text-books either do not mention them or, if they do so, consider them with the delirious or toxic-exhaustive states.

Although Ambroise Paré in the 16th century is credited with the recognition of post-operative psychosis, Dupuytren's in 1833 was the first comprehensive account. He wrote "... and finally the brain itself may be overcome by pain, terror or even joy, and reason leaves the patient at the instant when it is most necessary to his welfare that he should remain calm and undisturbed".

Constitutional predisposition and infection were early invoked to explain the post-operative psychoses, and with the advent of anaesthetics and antiseptics these too were added to the list. Psychoses following chloroform and ether anaesthesia, and associated with iodoform and carbolic acid antiseptics came to be reported quite frequently (Savage, 1887; Collins, 1888). The inclusion of entities such as delirium tremens did nothing to clarify the position, which became further complicated by the fact that cases of obvious toxic, infectious or hormonal origin were classified under this heading by some, but excluded by others. In contrast to this approach, the contributions of the surgeons such as Dent 1899, Kelly 1909 and Da Costa 1910, require emphasis. They stressed the role of the dread of operation, and the worries and anxieties associated with it, which was later to receive so much attention.

Kleist (1916) drew attention to the occurrence in many cases of an interval between the operation and the onset of the psychoses. He named this group the "*Interval Psychosis*", while Doyle later distinguished it from the post-anaesthetic and organic psychoses which are alleged to follow immediately upon the operation. Today the multiplicity of responsible factors is generally accepted (Washburne and Carns, 1935; Abeles, 1938). Biochemical, metabolic and vascular changes no less than the various psychological implications of surgery have been recognized as of importance in the aetiology of the post-operative psychoses.

Anaesthetics have for long been blamed for the post-operative psychoses, which can however occur when no anaesthetic at all is used. Dent (1899) dealt with this question—and anticipated Doyle and Kleist in some respects—when he wrote: "There is no doubt that anaesthesia may produce insanity, but I cannot believe that in cases where complete mental recovery takes place after the anaesthetic, and where the mania occurs after a distinct lucid interval of time, the anaesthetic has anything to do with the matter."

The post-anaesthetic syndrome, reviewed by Alfred Meyer (1944), is further distinguished by its clinical picture, for together with such symptoms as confusion, coma, and even progressive dementia, there occur as well signs of involvement of the central nervous system.

* This investigation was carried out when two of the authors (E.S. and B.B.Z.) were members of the staff of these hospitals.

These vary according to where the lesions of selective anoxia are sited (Batten and Courville, 1940) and they have included motor, basal ganglia, and autonomic disturbances (Steedman, 1939).

The *site of the operation* has been regarded as important with regard to the incidence of subsequent mental disorders. Eye operations are of especial interest, not only because post-operative psychoses have been supposed to occur more frequently than after operations elsewhere, but because of the obvious importance here of psychogenic and environmental factors. The dangers of post-operative blindfolding, with the consequent darkness enhancing the frightening aspects of the operation, quickly became realized. Besides blindfolding, which alone without operation may yet produce psychological symptoms, the age of the patient, usually over sixty, is significant. The rigidity of the personality then, limits the adjustment possible to the experience of operation. Bandaging the eyes may now produce a profound loss of security and orientation and even panic and "experimental" confusion. Characteristic of this condition is a fearful suspicious misinterpretation of the environment (Parker, 1913; Greenwood, 1928). It has been pointed out, however (Preu and Guida, 1937) that not all psychoses after eye operations are necessarily due to psychogenic panic. Should no improvement occur within two days of the removal of the bandages, some other psychosis—arteriosclerotic, or even schizophrenic or affective must be considered.

The particular liability of *gynaecological operations* to produce psychological sequelae remains widely accepted today, despite assurances that, endocrine effects apart, this be not the case (Sullivan, Zaki Ali, 1941). The relation of genital to mental disorder is noteworthy for the many fluctuations and changes of opinion that mark its history, so that what was by some regarded as a cure later was thought to be the cause of mental disease (Barnes, 1916). Keith (1889) condemned the removal of the uterus and ovaries because he claimed that insanity followed in 10 per cent. of those operated upon. Lawson Tait (1889), of the many who disagreed with him, pointed out that the incidence of insanity was no larger than that in the female population generally. The facts according to Hack Tuke's *Dictionary of Psychological Medicine* (1892) strongly supported the proposition that it was the deprivation of the uterus and ovaries, and not the mere surgical operation that led to insanity: "to unsex a woman is surely to maim or effect injuriously the integrity of her nervous system." In contrast there was the belief that pelvic diseases cause mental illness (Rohé, Hobbs, 1897; Taussig, 1912); so that gynaecological surgery became for a while a rational method of psychiatric treatment. Critics however were quick to point out that where relief obtained, success was more likely due to the special nursing attention received than to the operation itself (Russell, 1897). It is generally held that a disproportionate amount of emotion is aroused in any procedure concerning the genital organs, and that these operations therefore result in psychological complications more often than do others. The higher incidence of psychosis after lower bowel and genital operations has also been remarked upon, while Lindemann (1941) reported a special depressive reaction in women occurring twice as often after lower abdominal operations than after those on the upper abdomen.

The question has been raised whether the *age* of the patient, rather than the site of the operation was perhaps the risk-carrying factor (A. Lewis, 1955) and this must be taken into account, with other factors, in determining the importance or otherwise of gynaecological surgery.

Psychological factors. The contributions of Dent, Da Costa and Kelly have already been noticed in this respect. "A history of prolonged worry and dread of operation is the most influential cause of post-operative mental disturbance" (Kelly). "Many patients were worried and depressed and shrank from operation. When such a subject of anxiety comes into hospital he or she is unreasonable, irritable, suspicious and exacting . . . in one so predisposed a shock, loss of blood or any toxic influence or sepsis may be the last touch which finally overthrows the mental balance" (Da Costa). Dent too discussed the fear of operation and he ascribed the effects of gynaecological surgery to the contemplated rather than to the actual loss of function that might ensue.

More recently the organization of the personality as well as pre-operative anxiety and worry have been considered to be important (Abeles); abnormal psychological reactions being regarded as due to the largely unconscious significance of the operation for the individual rather than to the overt stresses he experiences. It has also been pointed out that the patient's unconscious needs influence the decision to undertake surgery as well as the outcome of it (Menninger, 1934). Helene Deutsch showed how great the disparity can be between the "real" danger of the operation and the "inner" dangers it may represent for the patient, and in consequence apparently minor surgery may prove more disastrous than a major procedure with its many more obvious dangers.

The role of fears of mutilation and death, castration wishes and anxieties, and the significance of the diseased organ both in reality and symbolically have all been described, but the claim that pelvic surgery, presumably on the basis of its specific emotional implications, has a particular liability to cause psychoses, requires further assessment.

Symptomatology. Acute and subacute organic reaction-types are most commonly held to constitute a post-operative psychosis. Although the non-specificity of these reactions has also been noted (Feiling) the belief none the less persists that the post-operative syndrome is a specific one. Muncie (1934) presented four cases showing an unusual type of excitement post-operatively. The elation and excitement he regarded as compensatory for the fear and

panic of the operation and its associated procedures (injections, transfusions, etc.). These performed without adequate explanation, together with the effects of drugs, dehydration and fever, and the misinterpretation of the attentions of nurses and doctors were thought to have produced a confusional state in which fear was very much in evidence. McDermott and Cobb (1938) likewise described a reaction differing from "the usual post-operative delirium". States of dreaminess and confusion, with panic, ideas of persecution, and even delusions and hallucinations occurred in four cases. This syndrome according to these authors was representative of a condition common in general surgical practice. Others have thought a manic type of reaction to be characteristic (Washburne and Carns, 1935), while a clinical picture resembling a state of agitated depression has been regarded as typical in women after lower abdominal operations (Lindemann, 1941). Exaggerated affective responses to operation have been described by V. H. Rosen (1950) in four patients following the loss of important body parts or functions. Although depressive symptoms more usually occurred, the manic episodes that were seen on occasion were believed to serve the purpose of denying the reality of the patient's situation.

A series of cases reported from a mental hospital (Oltman and Friedman, 1943) is of particular relevance here. Whereas the elderly patients presented with confusion and disorientation, the younger ones—aged under forty-five—suffered from a condition "usually quite indistinguishable from the ordinary case of schizophrenia". The authors concluded that any of the usual psychiatric entities may occur; they should be regarded as "post-operative" only in so far as the operation served as the exciting factor.

THE PRESENT STUDY

It was the purpose of this investigation to re-examine the problem of the post-operative psychoses, with special consideration of their clinical manifestations, their incidence, the types of surgical operations involved and of other aetiological factors.

The case material. A patient was regarded as suffering from post-operative psychosis if a mental disorder classifiable as psychotic had been precipitated by an operation. Eighty patients falling into this category were observed within a five-year period, 69 of them at St. Francis' Hospital Observation Ward and the remainder at the Maudsley Hospital nearby. The difficulties in controlling such material are considerable. Observation ward patients may be characterized by the severity of their behaviour disorder as well as by the social class from which they derive. The number of "specialist" hospitals in the "catchment area" may also influence the sample, for if an observation ward is close to such a hospital it will be likely to have an undue proportion of individuals suffering from psychosis after one type of operation (i.e. eye, gynaecological, etc.). If there was a complete lack of such hospitals in the area the sample could be equally unrepresentative by having too few cases of this kind. A survey of the hospitals in which the relevant cases had been operated on was performed. It justified the assumption that the sample was fairly representative of post-operative psychoses. The patients had come from thirty-five hospitals in all parts of London and even beyond, including all the London teaching hospitals with their active special departments.

We had no means of estimating the number of patients "lost" by direct transfer from a surgical department to a mental hospital or nursing home. Such factors as non-availability of observation ward beds, class of patient, existence of psychiatric facilities within the hospital in which the operation was carried out, ought to be taken into account. This was not possible, which makes the representative character of our sample somewhat uncertain. However, there were no indications that the leakage from these sources was considerable. Post-operative psychoses are mental disorders which develop suddenly, and in London patients of this type are admitted to the observation wards whenever possible.

Sites of operations. The sample comprised 57 females and 23 males aged 18 to 84. Their operations had been as follows:

	<i>Operations</i>						<i>M</i>	<i>F</i>
Eye							—	2
Nose							2	—
Teeth							2	7
Thyroid							—	5
Breast							—	3
Heart							1	—
Stomach							4	1
Appendix							1	6
Hernia							4	4
Bladder							3	1
Gynaecological							—	22
Other abdominal							2	3
Orthopaedic							2	4
Varicose veins							1	—

The most striking features of this list are the predominance of females and the high proportion of gynaecological operations. The significance of these figures is to be discussed later in this paper.

In the reports received from the surgeons there was no evidence of serious operative complications in any of those patients. The absence of such complications was confirmed in fifty cases by one of us (B.B.Z.) who examined the original full ward notes. Nor were references to untoward incidents related to the use of anaesthetics found, except in the case of a patient who developed ether convulsions halfway through a hysterectomy which proceeded uneventfully after the convulsions had subsided under pentothal. The psychosis commenced several weeks later.

Minor post-operative complications (stitch abscess, haematoma, urinary infections, mild pulmonary infections) were present in six patients. They promptly subsided with chemotherapy and local measures, and appeared unrelated with the post-operative psychosis. In only three patients were there more serious post-operative complications which appeared to coincide with the onset of the psychosis: a woman, aet. 41, had a haemorrhage into the vagina ten days after a gynaecological operation. She was given a blood transfusion following which she became very talkative and developed a manic psychosis. Another woman, aet. 31, had a pyrexia up to 102° three days after a Fothergill operation for prolapse. A *Bact. coli* urinary infection was found and successfully treated with streptomycin. She was re-admitted several days later with a slight vaginal haemorrhage and with difficulties of micturition. Now she was depressed and heard people telling her to drink large amounts of water. A typical depressive illness lasting several months ensued. The third serious post-operative surgical complication encountered was an infected haematoma of a thyroidectomy wound which preceded a confusional state. Whether or not in these patients the mental disorder would have developed without the intervention of the particular complications it is impossible to say. It does not appear, however, that the incidence of such complications in the group under review was greater than would be expected in any comparable sample.

Reaction types of post-operative mental disorder. The following reaction types were represented among the patients observed:

Affective illness	46 (depression 36, mania 9, mixed state 1)
Schizophrenia	12
Confusional states	21 (of these, 8 were associated with dementia and 1 with heart failure)
Neurotic reaction	1

Twelve of the 21 patients who developed a confusional state had been free from psychiatric symptoms at the time of the operation, while 8 patients were on retrospective examination found to have been demented before, though manageable at home. In those patients and in the one with heart failure the confusional episodes occurred immediately after the operation or on the following day, but of the other psychoses only two followed within 36 hours of the operation, while the remainder had a latent interval of from 6 to 14 days.

The fact that neurotic reactions were observed in one case only is entirely due to the fact that neurotics are only rarely admitted to an observation ward.

Intervals between operation and onset of psychiatric symptoms. The interval in the cases where this could be established were as shown in Table I.

Time from operation	0-24 hours	-3 days	-5 days	-10 days	-2 weeks	-5 weeks	-9 weeks
Number of patients	7	7	8	15	12	13	3

Apart from the early appearance of confusional symptoms mentioned above, there was no relationship between interval and type of operation.

Symptoms. They conformed on the whole to those of the reaction types observed generally. An admixture of features of a confusional state, especially of a degree of perplexity, to an otherwise typical psychosis was not infrequent.

Four cases showed a mixture of confusion with other symptoms in the early acute stages, which subsequently cleared to give the more characteristic picture of one or other of the usual reaction types. The following two cases exemplify this course of events.

Male, 39. Quite well until one week after dental extraction under "gas" when he had had a vision of the Lord standing by him. He later became restless and confused and talked of the Lord and Lord's Day. From the Observation Ward where he presented a picture of a confusional state with Ganser-like features, he went to a mental hospital. There he deteriorated. His delusions, hallucinations and thinking were characteristic of schizophrenia. His violent behaviour necessitated certification. Three years later he was still in hospital.

Female, 46. No previous mental illness until 6 days after operation for hernia. Then she became acutely depressed and disorientated for time, place and person. The confusion cleared but her delusions persisted and she heard critical voices and felt unclean, guilty and ruined. This depressive state responded to a course of E.C.T.

In some patients the news of the impending operation seemed to have had a disturbing effect. A woman of 45 became very anxious on hearing that she needed a hysterectomy. Three weeks after operation she developed a severe depressive reaction requiring hospital treatment. Another patient expressed a dread of the anaesthetic when she learnt that she was to have a ventrisuspension operation. She feared she might die during the operation which was followed by a depressive illness.

The significance of these emotional reactions preceding the operation is uncertain. They are very common but only exceptionally are they followed by post-operative mental disorder.

Psychiatric sequelae to successive operations. There were no consistent reactions to successive operations in individual patients. In some cases each surgical intervention was followed by a psychotic reaction; but more usually while one operation has this result, others both before and afterwards have no such sequel.

A woman of 35 who became hypomanic after a varicose vein operation earlier in the year, suffered a more severe manic reaction after mastectomy later.

Another woman, aet. 57, whose vaginal repair in 1952 was followed by a post-operative psychosis, had had operations previously without complications: hysterectomy, 1922; appendicectomy, 1935; and mastectomy, 1938.

Woman, aet. 47; colostomy operation was followed by an acute affective illness, but three subsequent operations: bowel excision, closure of colostomy and salpingo-oophorectomy were all without sequelae.

Post-operative and puerperal psychoses in the same patient. The present study would appear to confirm the similarities between these two groups of psychoses which have been pointed out by previous authors. There were three patients in this series who had at some time previously developed an acute mental illness following childbirth.

A woman whose first puerperal mania followed the birth of her fifth child at the age of 30, had a sixth without mishap two years later. A hysterectomy at 49 was also uneventful, but a colpo-perineorrhaphy at 64 led to a post-operative depressive psychosis.

Female, aet. 40. Five confinements had been uneventful as was a Fothergill operation a year before present illness. This, an agitated depression, occurred four weeks after the birth of sixth child by Caesarean section in which sterilization also was performed. In this case the precipitating event was an operation and childbirth at the same time.

A woman who had had a puerperal depression relieved by E.C.T., had a further attack after myomectomy 4 months later.

A woman of 31 was admitted for an acute attack of mania which started 13 days after bilateral salpingectomy. She had had four previous manic attacks, two of which had followed childbirth.

Location of operation related to post-operative psychosis. An attempt has been made to relate locations of operations to types of mental disorder and compare the groupings with control samples. Women alone have been considered because the number of observations we had on men was too small for any detailed statistical analysis. Patients under twenty were excluded because it was felt likely that many adolescents would find provision other than in an observation ward; while those over fifty-nine were not included so as to avoid possible senile complications. The type of reaction was classified as above, and at the same time cases were considered according to the location of the operation, and under the age groups shown (Table II).

It would seem from the table that a remarkable number of psychotic illnesses may occur after gynaecological operations. This would at first thought appear to bear out the contention that women are more prone to breakdown after these operations than after other kinds. A statistical test of this contention will be made later.

The small number of schizophrenic illnesses after operation is also notable, as is the high frequency of affective reactions.

Although the aims of this study must necessarily be limited by the lack of fully controlled data, it is still possible to pose certain questions and to try to answer them. For example, by comparing an estimate of the frequency of different types of operation in patients living in the area of our observation ward, with that of psychoses after these operations in the series, some idea can perhaps

TABLE II
Female Post-operative Psychooses

Age group	20-29			30-39			40-49			50-59			Total		
	Aff.	Sch.	Oth.	Aff.	Sch.	Oth.	Aff.	Sch.	Oth.	Aff.	Sch.	Oth.	Aff.	Sch.	Oth.
Type of post-operative psychosis (P.O.P.)	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
Gynaecological	5			2+(2)	1	5+(2) (1)				1	1	12+(4)1+(1)	2		20
Abdominal (non-gynaecological)	2	1				3 (1)				4 (1)		9	1+(2)		12
Eye												1+(1)			1+(1) 2
Thyroid							1		3	1		2			3 5
Other operations				5+(1)	1					2		7+(1)			9
														35	5 8 48

(Figures in brackets indicate cases having had previous psychiatric treatment.)
Aff.: Affective Psychosis. Sch.: Schizophrenia. Oth.: Other psychoses.

be gained about whether operations on certain organs or body areas are more liable than others in causing psychotic illness. Another question within the scope of this study is whether there is any change of proneness to mental illness with age. This can be answered by comparing an estimate of the numbers of operations in the same population, with the frequency of the post-operative psychoses at each age level.

In order to attempt an answer to these questions, a sample was gathered to provide an estimate of the number of operations carried out upon different parts of the body at different ages. It consisted of all operations performed in one year on patients between the ages of 20 and 59 at two large general hospitals in the immediate neighbourhood of the observation ward, one of them a teaching hospital. The total number of cases in this control sample was as shown in Table III.

TABLE III

	Male	Female
Hospital I	441	965
Hospital II	1,098	2,391
Total	1,539	3,356

For the purpose of this investigation these cases have been summed; and while its representative nature may be questioned, we can only state that we know of no particular bias in the data.

A comparison of the frequency of male to female post-operative psychoses (P.O.P.). The relative proneness of males and females to post-operative mental disorder was estimated by comparing the frequencies of the post-operative psychoses with those of operations carried out on males and females over the same age range in the control sample from the two hospitals (Table IV).

TABLE IV

	Male	Female
Post-operative psychoses	24	48
Operations in control sample	1,539	3,346

A χ^2 test is not significant and this suggests that neither sex is the more prone to mental illness after operation.

It was further of interest to discover whether the male:female ratio in the post-operative psychoses is the same as that occurring in psychoses generally. Table V below compares the post-operative psychoses with an example of psychotics as seen in the observation ward and mental hospital.

TABLE V

	Male	Female
Post-operative psychoses	24	48
Observation ward (admissions 1 year)	372	506
Mental hospital (1 year admissions)	168	306

(a) Between P.O.P. and O.W. samples χ^2 is not significant.

(b) Between P.O.P. and M.H. samples χ^2 is not significant.

(c) Between O.W. and M.H. samples $\chi^2 = 6 \cdot 10$. This is significant at the .02 level.

There is therefore no evidence from the above Table to suggest that there is a difference in the proportion of males and females in either the post-operative or the control groups. The differences between these proportions in the two controls, while emphasizing the incompleteness of our sampling methods, need not invalidate the results of comparing each control with the P.O.P. sample.

A comparison of the frequencies of post-operative psychoses (P.O.P.) in women at different age levels. If the frequencies of operations at different age-levels in the control sample are assumed to be representative of the operations from which the sample of post-operative psychoses has been derived, then an estimate of change with age in proneness to post-operative psychoses may be obtained from Table VI below. This shows the frequencies of the post-operative and control samples in four age categories.

TABLE VI

Age Level	Post-operative Psychoses P.O.P.	Control Sample C.	P.O.P./C.
20-29	8	942	.008
30-39	12	1,022	.012
40-49	16	830	.019
50-59	12	562	.021
	48	3,356	.0143

A test of significance between the proportions at different age levels shows $\chi^2=7.20$. This is significant at a .05 level on a one-tail test.

If the assumption concerning the representative nature of the control sample is justified, then the ratio P.O.P./C. can be used as an indicator of the change with age of proneness to psychotic illness. This ratio increases with age. The χ^2 test suggests that this is a significant co-variation. Thus we may conclude that there is some evidence here to suggest that women become more prone to post-operative mental illness as they grow older. Is this a characteristic of the post-operative psychosis, or is it but an expression of a tendency found in psychoses generally? In Table VII the change in proneness to mental illness with age in the post-operative psychoses is compared with that of cases in the observation ward, and in a mental hospital.

TABLE VII

	Post-operative Psychoses	Mental Hospital	Observation Ward
20-29	8	54	103
30-39	12	65	141
40-49	16	101	151
50-59	12	86	111

(a) Between P.O.P. and O.W. sample χ^2 is not significant.

(b) Between P.O.P. and M.H. sample χ^2 is not significant.

(c) Between O.W. and M.H. samples $\chi^2=7.63$. This is significant at the .05 level on a one-tail test.

Table VII therefore shows that the post-operative sample reflects the same age tendency as in the other two, although there are differences on this score between the mental hospital and the observation ward samples.

An estimate of the relative proneness of women to post-operative psychosis after operations on different parts of the body. It has been maintained that a

person is more prone to psychosis after an abdominal operation than after surgery upon other parts of the body. A test of this can be made by comparing the frequencies of psychosis after abdominal and other operations with the frequencies of these types of operation in the control sample. This is done for different age levels in Table VIII.

TABLE VIII

	20-29		30-39		40-49		50-59		Total	
	Ab-dominal	Others	Ab-dominal	Others	Ab-dominal	Others	Ab-dominal	Others	Ab-dominal	Others
Post-operative sample	8	0	5	7	12	4	7	5	32	16
Control sample ..	604	338	702	320	531	299	330	232	2,167	1,189
	χ^2 not sig.		χ^2 not sig.		χ^2 not sig.		χ^2 not sig.		χ^2 not sig.	

From this Table it is clear that there is no evidence to suggest that abdominal operations are any more prone to cause psychosis than are operations on other parts of the body.

All gynaecological operations. Another strongly held view is that women are especially prone to psychotic illness after gynaecological operations. Table IX gives a comparison between psychoses after these operations and after non-gynaecological abdominal ones.

TABLE IX

	20-29		30-39		40-49		50-59		Total	
	Gynae-cological	Other Ab-dominal	Gynae-cological	Other Ab-dominal	Gynae-cological	Other Ab-dominal	Gynae-cological	Other Ab-dominal	Gynae-cological	Other Ab-dominal
Post-operative sample	5	3	5	0	8	4	2	5	20	12
Control sample ..	451	153	529	173	323	208	136	194	1,439	728
	χ^2 not sig.		χ^2 not sig.		χ^2 not sig.		χ^2 not sig.		χ^2 not sig.	

Here again there is no evidence to suggest a difference of proneness to psychosis after gynaecological operations than after others. The high frequency of psychoses after gynaecological surgery was matched by the large number of such operations performed in the area.

However, this held true only if all types of gynaecological operations were included in the control group. If operations were divided into hysterectomies and others, the result of the comparison was different.

A comparison of psychoses after hysterectomies and after other gynaecological operations. All age levels have been combined as the frequencies do not allow of a further breakdown. The result of the comparison is shown in Table X. Although the numbers are small the figures strongly suggest that hysterectomies are more liable to be followed by psychoses than other gynaecological operations.

TABLE X

	Hysterectomies		Other Gynaecological Operations	

Post-operative sample ..	..	7	..	13
Control sample ..	..	174	..	1,265
	$\chi^2=9.04$ significant at the .005 level			

The average age of the patients subjected to hysterectomy was 48 at the time of operation, while it was 35 among those subjected to other gynaecological

operations. The age distribution in the teaching hospital control group of hysterectomies showed a peak in the 41-50 age group, which was in accordance with the average age of the patients who developed mental disorders following this operation.

The type of psychotic reaction occurring post-operatively. Another problem is whether the post-operative case tends to develop any particular type of psychosis. This can be investigated by comparing the frequencies of the different types of post-operative psychosis in the series, with the frequency of the reaction-types found among a representative sample of psychotic patients.

The apparently small proportion of schizophrenics and large number of affective reactions in the post-operative psychoses has already been commented upon. An estimate as to whether these proportions differ significantly from what would be expected from the ordinary run of psychotic illnesses was obtained by comparing them with a control sample of other patients admitted in one year to the observation ward.

Table XI shows the frequencies of schizophrenic as opposed to other diagnoses in the post-operative group and control sample for women between the ages of 20 and 59.

TABLE XI

	20-29		30-39		40-49		50-59		Total	
	Schizo-phrenic	Others	Schizo-phrenic	Others	Schizo-phrenic	Others	Schizo-phrenic	Others	Schizo-phrenic	Others
Post-operative psychosis ..	1	7	0	12	2	14	2	10	5	43
Control sample ..	47	56	55	86	63	88	35	76	200	306
	$\chi^2=4.82$ Sig. at .05 level		$\chi^2=5.72$ Sig. at .01 level		$\chi^2=5.90$ Sig. at .01 level		χ^2 not sig.		$\chi^2=153.0$ Sig. at .0001 level	

Here the frequency of post-operative schizophrenias is significantly less than would be expected if the post-operative patient was as prone to develop the different psychotic reactions as does the ordinary patient admitted to the observation ward. A person, therefore, appears to be unlikely to develop a schizophrenic reaction after an operation. Even if allowance is made for uncertainties of diagnosis, the level of significance in the above Table would still seem to validate this claim, provided the post-operative sample is representative.

The high preponderance of affective reactions among the post-operative patients also requires further scrutiny to decide whether the differences between the affective and other reactions differ from the general distribution of psychotic breakdowns. In Table XII all schizophrenic patients are excluded, and a comparison is made between the frequency of affective and other reactions in the post-operative group, and the control sample of observation ward patients. These are once again all women between the ages of 20 and 59.

TABLE XII

	20-29		30-39		40-49		50-59		Total	
	Affec-tive	Others	Affec-tive	Others	Affec-tive	Others	Affec-tive	Others	Affec-tive	Others
Post-operative psychosis ..	7	0	10	2	11	3	7	3	35	8
Control sample ..	38	18	59	27	65	23	57	19	219	87
	χ^2 not sig.		χ^2 not sig.		χ^2 not sig.		χ^2 not sig.		χ^2 not sig.	

From this Table it would appear that post-operative reactions are no more likely to be affective in type than in psychoses generally. We can also confirm

from this Table that the earlier findings about increased proneness with age (Table XII) applies also to the affective reactions.

The effect of location of operation upon the type of psychotic reaction. The suggestion is made from time to time that abdominal and gynaecological operations are more likely to evoke affective rather than other types of reaction.

Table XIII gives some evidence concerning this question. It shows the frequencies of schizophrenic, affective and other reactions to gynaecological, abdominal and other operations in the sample of female post-operative psychotics. All ages between 20 and 59 are pooled, as the numbers are too small to consider otherwise.

	Schizophrenic	Affective	Others
Gynaecological	2	16	2
Abdominal (non-gynaecological) ..	3	9	0
Others	0	10	6

A break-down of this Table so that Fisher Yates Tests might be applied was carried out. The results suggested that neither gynaecological nor other abdominal operations are more likely to produce affective reactions than are operations on any other part of the body.

DISCUSSION

The scope of this study was limited by the nature of the clinical material available. The large majority of the patients were observed in a mental observation ward where only patients with serious behaviour disorder are admitted. For this reason milder post-operative psychiatric disorders, especially those of a neurotic type which are probably much more frequent than those reported here, were not included.

There was no evidence that there is an entity "post-operative psychosis". The clinical status of "post-operative psychosis" is similar to that of "puerperal psychosis", which likewise has been proved to manifest itself in a variety of common reaction types (Jacobs, 1943). Whether and what type of psychosis develops in an individual obviously depends on predisposing factors, the operation or childbirth respectively acting as the precipitating cause. The role of emotional factors, which has been assumed to be important for both, remains uncertain, at least as far as the post-operative psychoses are concerned. The fact that several patients of this series had had puerperal as well as post-operative psychiatric illnesses demonstrates the kindred nature of these conditions. They also have in common the frequent feature of an interval between the stressful event and the onset of manifest psychiatric symptoms.

In none of the patients of this series could anaesthesia be regarded as an aetiological factor. Such an assumption would be justified only in cases where no mental disorder had been present before the operation and where there was a history of prolonged anoxia during the operations. In none of the patients of this series was there such a history.

An attempt has been made to examine the question whether there is a significant correlation between the site of the operation and the incidence of post-operative psychoses. No such relationship could be established except for hysterectomies, which seemed to carry a greater risk of psychotic illness than other gynaecological operations.

The reasons for the comparatively higher incidence of psychoses following hysterectomy could not be fully explored in this investigation, as a closer psychological study of individual patients was not possible. Several factors may contribute to this exceptional position of hysterectomy among gynaecological operations: its psychological significance, its frequency in a particularly vulnerable age and the magnitude of the surgical procedure involved. The importance of the age factor could be clearly demonstrated.

Possibly other operations might have been found to play a similar role to that of hysterectomy in precipitating mental disorders, had the size of our sample been greater. Our investigation therefore, has not invalidated statements to that effect, although it has made them more questionable. It has pointed to the way in which they could be tested. The final answer might come from large scale investigations carried out on a regional basis; only thus could the representative character of the sample of post-operative mental disorders and of the controls be ensured.

The comparatively large proportion of dental operations in this series is noteworthy. This is not surprising considering the enormous incidence of these operations, and it can be assumed that they acted, like the other operations, as precipitating events in predisposed individuals. It is, however, of interest that they had in this respect the same effect as the other operations, most of which belonged to the field of major visceral surgery. In all cases concerned the dental operations consisted in multiple extractions carried out either in one session or in quick succession.

In view of the finding that the incidence of psychoses following operations did not exceed expectation, the question may be asked whether in the cases observed the association of psychosis with the operation was not purely coincidental. One of the reasons why this is unlikely is the frequent occurrence of perplexity and bewilderment in the clinical picture, a feature indicative of an organic origin.

Would those patients, then, not have developed a mental disorder if they had not had their operations? The answer is that they probably would not have had that mental illness at that particular time, but probably on some other occasion and precipitated by some other stressful event physical or mental. Apparently, a certain proportion of psychotic illness in general is reactive in that sense, and operations represent one group of the agencies precipitating psychoses in those predisposed to them. It seems likely that childbirth acts in the same way. The finding, therefore, that the incidence of psychoses following operations did on the whole, not exceed expectation, does not imply that the relationship between the two events is coincidental.

The fact that the number of post-operative schizophrenic psychoses was even lower than could be expected in a corresponding number of patients admitted to a mental observation ward may have been due to the character of the sample which possibly was not quite representative. However, it is more likely to be due to the nature of schizophrenic reaction types, whose onset is usually gradual and insidious and which one would therefore expect to be under-represented among a group of patients whose mental disorders have a circumscribed precipitating event and an acute onset in common.

CONCLUSIONS

A series of 80 cases of post-operative mental disorder were studied from the clinical and statistical points of view.

A variety of common reaction types was observed. Confusional states

related solely to the operation, formed only a small group. There was no evidence for the existence of a clinical entity "post-operative psychosis". The largest single group among the reaction types observed was that of affective illness. There was no indication that the surgical complications or the use of anaesthetics were of aetiological importance.

The types of post-operative mental disorders observed were similar to those occurring after childbirth. Post-operative and puerperal psychoses share the common feature of an interval between the stressful event and the onset of psychiatric symptoms. Some patients had had both post-operative and puerperal psychosis.

Abdominal and especially gynaecological operations were highly represented in the sample studied. A comparison of the relative frequency of such operations among control groups demonstrated that their high representation among the post-operative psychoses was matched by their high incidence among the general population. Hysterectomy was followed by psychosis comparatively more frequently than other gynaecological operations. Age could be shown to be an important factor in this discrepancy.

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REFERENCES

- ABELES, M. M., *Amer. J. Psychiatry*, 1938, **94**.
 ALI, Z., *Arch. Suisse de Neurol. et Psych.*, 1941, **47**, 1.
 BAKWIN, H. J., *Paediat.*, 1952, **36**, 262.
 BARNES, F., *Surg. Gynaec. Obstet.*, 1916, **22**, 579.
 BATTEN, C. T., and COURVILLE, C. B., *Anaesthesiology*, 1940, **1**, 261.
 COBB, S., and MCDERMOTT, N. T., *Med. Clin. N. America*, 1938, **22**, 569.
 COLLINS, W. J., *Lancet*, 1888, December 15, 1175.
 DA COSTA, J. C., *Surg. Gynaec. Obstet.*, 1910, **11**, 572.
 DENT, C. T., *J. Ment. Sci.*, 1889, **25**, 1.
 DEUTSCH, H., *Psychosom. Med.*, 1942, **4**, 105.
 DOYLE, J. B., *Brit. J. Anaesth.*, 1938, **6**, 37.
 DUPUYTREN, —, *Lancet*, 1833, Vol. 11.
 EBAUGH, F. G., *Bull. Amer. Coll. Surg.*, 1937, **22**, No. 3.
 FEILING, A., *Practitioner*, 1937, **138**, 1259.
 GREENWOOD, A., *J.A.M.A.*, 1928, **91**, 1713.
 HOBBS, A. T., *Brit. Med. J.*, 1897, **11**, 769.
 JACOBS, B., *J. Ment. Sci.*, 1943, **89**, 242.
 KEITH, —, quoted by G. B. Bantock, *Brit. Med. J.*, 1889, 7 August.
 KELLY, H. A., *Amer. J. Obstet. Gynec.*, 1909, **59**, 1035.
 LINDEMANN, E., *Amer. J. Psychiat.*, 1941, 98–132.
 LEWIS, A., *Report XVI Congrès International de Chirurgie*, 1955.
 MENNINGER, K. A., *Psy. Quart.*, 1934, 111.
 MEYER, A., *Recent Progress in Psychiatry*, 1944, Vol. 1.
 MUNCIE, W., *Arch. Neurol. and Psych.*, 1934, **32**, 4.
 OLTMAN, J. E., and FRIEDMAN, S., *Psychiat. Quart.*, 1934, **17**, 3.
 PREU, W. P., and GUIDA, F. P., *Arch. Neurol. and Psychiat.*, 1937, **38**, 818.
 ROHE, G. H., *Brit. Med. J.*, 1897, **11**, 766.
 ROSEN, V. H., *Psychosom. Med.*, 1950, **12**, 356.
 RUSSELL, J., *Brit. Med. J.*, 1897, **11**, 770.
 SAVAGE, G. H., *Brit. Med. J.*, 1887, 3 December.
 TAIT, L., *Brit. Med. J.*, 1889, 31 August.
 WASHBURN, A. C., and CARNS, M. L., *J. Nerv. and Ment. Dis.*, 1935, **82**, 5.