THE CANCER PROBLEM—WITH SPECIAL REFERENCE TO CANCER OF THE CERVIX

Prevalence, Special Surgical Technique and Evaluation of Results

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One of the most urgent tasks of the day is to fight cancer with knowledge. During the last half-century, remarkable progress has been made in reducing the incidence and mortality rate of some chronic diseases like tuberculosis and naturally the workers on cancer research feel that in the not-too-distant future the nature of cancer will be revealed, and the incidence and the mortality rate controlled. As it stands today, except in undeveloped tropical countries, cancer is No. 2 killer of human beings, No. 1 being heart disease.

During the last 50 years, extensive and exhaustive investigations have been carried out from clinical and demographic points of view but fundamental researches through biological studies were begun not more than a quarter of a century ago. Research is always a co-operative enterprise. Ideas are born in individual minds but their formulation is influenced by a wide variety of contacts and their translation into practical reality is aided by the entire scientific community.

Prevalence of Cancer

Assessment of the prevalence of a disease is not an easy task, specially for a vast country like India, having a population of nearly four hundred millions extending over about 1.2 million square miles. Excepting a few principal cities, a greater part of the land is underdeveloped and the registration for vital statistics is inadequate. Proper assessment is hardly possible without sampling studies of the whole population.

The incidence of cancer is usually deduced from hospital records, from admissions and autopsies as well as from total mortality figures in general. Clinical assessment is often vitiated by wide errors unless checked by biopsies which are not always possible. Autopsies will, perhaps, give more correct information, but autopsies on every death can never be possible. Even in a well-organized country like Germany where

the post-mortem examination was obligatory in all the State hospitals, autopsies were made on an average of 4.3% of the total deaths of the land.⁷

A certain amount of work on cancer mortality in India has already been done. From the initial subjective opinion that, as compared to the European races, the Indian races were comparatively less susceptible to carcinoma, there has been a gradual shift; the analysis of hospital and autopsy records and the reported causes of death in city population tend to show that the cancer mortality is not much lower in India than in the West. But the picture is still far from definite.

Some investigations on these lines were made by the author¹⁴ with the data from the city of Calcutta. The prevalence has been broadly equated to mortality from cancer. Before dealing with the death records of Calcutta Corporation Area (on which this note mainly relies), a passing mention may as well be made of other relevant data collected for this purpose. For example, out of a total of 9,130 deaths occurring among the inpatients of the Calcutta Medical College Hospital during 1946-50, only 249 deaths (or 2.7%) were caused by cancer; the annual rate of cancer deaths in the Hospital actually varied between 2.2% (1942) and 3.8% (1943) during this period. Autopsy records of the same Hospital for the same period disclosed only 11 cancer deaths out of 549 total cases, giving a cancer mortality of about 2%. Autopsy records of Rogers¹⁷ from the same Hospital showed a 4.59% cancer mortality. Data were also collected from a few insurance companies in India and the cancer mortality was seen to vary between 2 and 3.5% among the assured. These total measures of mortality are, however, of little validity or use for comparative study; they are besides based on highly select and rather scanty material. Vishwa Nath and Grewal²⁰ from collected autopsy records of different parts of India and Burma, found the

TABLE 1
PROPORTION OF CANCER DEATHS IN 100 DEATHS FROM ALL CAUSES
(Calcutta Corporation Area, 1954 and 1955)

Calendar Year	Sex	Age in Years						All Ages
		0-19	20-29	30-39	40-49	50-59	Over 59	
1954	Male	0.2 (12.7)	0.8 (2.2)	2.0 (2.1)	5.2 (2.5)	6.2 (2.8)	5.5 (4.5)	2.4 (26.8)
1955	"	0.1 (13.4)	1.7 (2.1)	3.0 (2.1)	5.7 (2.5)	6.8 (2.8)	7.1 (4.7)	2.9 (27.6)
1954	Female	0.1 (12.2)	1.1 (2.3)	4.0 (1.5)	8.8 (1.3)	9.5 (1.5)	4.5 (4.2)	2.3 (23.0)
1955	"	0.1 (12.4)	1.1 (1.9)	4.6 (1.4)	10.7 (1.2)	9.6 (1.5)	5.4 (4.2)	2.7 (22.6)
Combined persons, 1954-55		0.1 (50.4)	1.1 (8.6)	3.2 (7.2)	6.9 (7.6)	7.6 (8.6)	5.7 (17.6)	2.6 (100.0)

TABLE 2
PROBABILITY OF DEATH FROM CANCER IN DIFFERENT AGE RANGES
(Calcutta Corporation Area, 1954 and 1955, and 1951 Census West Bengal Life Tables)

Present Age (years)	Sex	Age Range of Life (years)						Total
		0-19	20-29	30-39	40-49	50-59	Over 59	
0	Male	.001	.002	.001	.005	.006	.011	.026
	Female	.000	.001	.004	.010	.008	.008	.031
20	Male	—	.002	.004	.010	.012	.022	.050
	Female	—	.001	.009	.019	.017	.015	.061
30	Male	—	—	.004	.011	.015	.025	.055
	Female	—	—	.010	.021	.019	.018	.068
40	Male	—	—	—	.014	.018	.030	.062
	Female	—	—	—	.028	.024	.023	.075
50	Male	—	—	—	—	.025	.040	.065
	Female	—	—	—	—	.034	.032	.066
60	Male	—	—	—	—	—	.063	.063
	Female	—	—	—	—	—	.050	.050

cancer mortality rate to be 4.2%. Khanolkar⁶ had found 4.41% from the Bombay K.E.M. Hospital autopsy records. The percentages given by both Vishwa Nath *et al.* and Khanolkar are to be considered as *relative* cancer mortality figures because they eliminated deaths due to infectious and tropical diseases from the total number of deaths.

To enable better assessment and comparisons, the total deaths registered with Calcutta Corporation were examined in detail. The proportion of uncertified deaths was very low, less than 2% of total deaths in Calcutta, whereas 98% of deaths were certified by qualified medical officers.

Out of a total of 64,487 certified deaths (i.e. 32,113 in 1954 and 32,374 in 1955), the proportion of cancer deaths came out as 2.4 and 2.8% respectively. The variation between the years appeared to be high for a cause like cancer, but

improved identification was probably responsible for the increased proportion in 1955. While the proportion of cancer deaths to all deaths generally rose to a maximum in the 50-60 age-group and declined after that, cancer mortality as such was substantially higher in the over-59 age-group (Table 1).

The information about the probability of death from cancer at the various ages will be interesting. The probabilities found by fusing 1951 West Bengal Census Life Table¹⁶ mortality with Calcutta Corporation cancer death proportions in age-groups have been worked out. (Table 2.)

People at large will be more interested in knowing their own chances of escaping or dying of cancer than in the mean annual mortality from it. The probability of death from cancer was of the level of 2.8% at birth, and this rose to the level of 6.8% by the time age 40 was attained. The

FIG. 1.—Percentage distribution of cancer deaths by age: comparison of Indian and American statistics (males only). Indian males (Calcutta Corporation records, 1954 and 1955). American males (Steiner, 1954).

FIG. 2.—Cancer of the female genitale organs. Percentage distribution of deaths by age: comparison of Indian and American statistics. Indian data (Calcutta Corporation records, 1954 and 1955). American data (Steiner, 1954).

probability of death from cancer was higher for the female than for the male up to age 40; the position was reversed by age 60.

The percentage distribution of cancer deaths by age for the Calcutta Corporation area was compared with similar distribution for the U.S.A. data given by Steiner.¹⁸ The comparison is presented graphically in Figure 1 for males. The age distribution patterns of cancer showed good agreement between the two countries, excepting at very advanced ages. The age distribution of cancer of the female genital organs was also similarly compared; the patterns of age distribution of this particular site disclosed strikingly close agreement, as Figure 2 demonstrates. The patterns could have such close resemblance as the defects of diagnosis and reporting, which pulled down the totals, were basically independent of the age of the subject.

An Estimate of the Prevalence of Cancer in India

Since the extent of prevalence of cancer in India was not known, a dimensional estimate based on the Calcutta investigation is attempted below. A number of broad assumptions had to be made and the estimate is somewhat speculative. Yet it is clear that in view of the grave defects in the sphere of diagnosis and reporting, even a very rough and tentative estimate indicating the lowest level of prevalence will be useful as a starting point.

The first important assumption was that the Calcutta Corporation cancer death proportions could be taken as representative of the country as

a whole. Other assumptions were about the current level of total mortality in the country and the distribution of life with cancer over duration since onset.

In any region, the community habits are not basically different between the rural and the urban bulk of the urban sector; nor are any other sharp differences between the rural and the urban environmental factors known which might introduce a significant disparity in carcinogenic dosage except perhaps in relation to the cancer of the lung. Lung cancer is of very minor frequency even in the Calcutta Corporation area. The Calcutta experience could therefore be representative of the country in this respect, particularly as it is a big cosmopolitan city inhabited by people from many parts of India; and the migrants usually carry their habit-patterns with them.

But owing to the location of specialised cancer institutions and hospital departments, and because of the availability of advanced surgical facilities generally, more cancer cases come to Calcutta; the question therefore was whether this eventuality resulted in a higher proportion of cancer deaths in Calcutta Corporation area. Few cases died while on the operation table or while being treated actively and not able to move away. With no hope for recovery, people preferred to return to their own home surroundings in their last days, specially in an affliction like cancer when there is nothing more to be done. General reasoning therefore warrants the assumption that the Calcutta Corporation deaths will not be inflated by migrated cancer cases and informed clinical opinion is not to the contrary. We there-

FIG. 3.—Survival with cancer. (Estimated on the basis of the author's experience.)

fore consider the assumption valid that the cancer death proportions of the Corporation area hold generally for the country.

Adopting the current national death rate as 20 per thousand broadly, the total annual deaths from all causes will number 7.6 millions in the estimated 1955 Indian population of 380 millions; applying the Corporation cancer death proportions, the estimated cancer deaths number 0.198 or 0.2 million roughly.

The next problem was to relate the cancer death proportion to the prevalence rate. Under stationary conditions, the rate of incidence will be equal to the death rate plus the cure rate. The cure rate in the case of cancer being small for the country as a whole, the cancer death rate may be taken as the rate of cancer incidence for the purpose of this rough approximation; the rate of incidence will actually be slightly higher.

The relationship between the rate of incidence and the rate of prevalence could be discussed with advantage on a theoretical plane at this stage. If i be the annual rate of incidence and $f(t)$ the frequency distribution of cases living with cancer over duration t since onset, so that $f(0) = 1$ and $f(\alpha) = 0$, then P the rate of prevalence is given under stationary conditions by the area integral,

$$P = i \int_0^{\infty} f(t) \cdot dt.$$

While the mathematical relationship between incidence and prevalence given above is quite straightforward, all its implications are not. For example, if cancer of different organs were considered separately, it will be found that the organ prevalence rates will not be proportional to the relative incidence rates; but will differ according

to the average duration of life with cancer for the particular organs.

The duration of life with cancer varies with the site and type of cancer. But it is not possible to introduce any refinement for this variation in the present attempt at first approximation. The average duration of life with cancer even for all cancers taken together is not known firmly for any country, much less for India. A broad assumption was again made on the basis of our experience; and the shape of frequency distribution of life with cancer was taken as in Figure 3; if such a distribution holds, the average duration of life with cancer is about 3 years, and the prevalence of cancer in India amounts to 0.6 million in round figures.

Personally I feel that the gaps in diagnosis and in reporting are very substantial and the prevalence of cancer in India is at least three times as much as has been estimated, i.e. 1.8 million. This statement may be substantiated by the fact that though it is not definite that vulnerability to cancer is the same in India as in say U.K., age-specific Calcutta-reported cancer death rates applied to the U.K. age structure produce an overall cancer death proportion of 7.6% (of total deaths), whereas the actual reported proportion in U.K. (1953-54) is 17.9%. On the other hand, age-specific cancer death rates of U.K. (1953-54) applied to the Calcutta age structure produced an overall cancer death proportion of 6.5%, instead of 2.6%, as has been actually registered in 1954 to 1955. Hence my assumption that the prevalence of cancer in India is at least 1.8 millions.

Prevalence of Cancer of the Cervix

Although the incidence of cancer does not vary much in different countries of the world, it has been well established that the anatomical dis-

TABLE 3

INCIDENCE OF CERVICAL CANCER ON ETHNOLOGICAL BASIS—CHITTARANJAN SEVA SADAN COLLEGE OF OBSTETRICS GYNAECOLOGY AND CHILD HEALTH

Religious Group	1940-50		
	Total Number of Gynaecological Cases	Cancer Cervix Cases	Percentage*
Hindu	89,271	569	0.637 ± 0.03
Muslim	4,556	20	0.439 ± 0.10
Others	550	4	
	94,377	593	

* Difference between the Hindu and Muslim is not statistically significant, the value being 0.198 ± 0.102.

TABLE 4

INCIDENCE OF CERVICAL CANCER ON ETHNOLOGICAL BASIS—CHITTARANJAN CANCER HOSPITAL (1950-55)

Year	Total Gynaecological Cases Attended			Cancer of the Cervix Detected		
	Hindu	Muslim	Others	Hindu	Muslim	Others
1950	487	8	5	228 (59.1)	4 (50.0)	3
1951	755	19	9	396 (52.4)	10 (52.6)	3
1952	797	25	12	379 (47.6)	16 (64.0)	7
1953	747	31	10	328 (43.9)	15 (48.4)	2
1954	794	37	9	341 (42.9)	25 (67.5)	3
1955	908	56	15	369 (40.6)	32 (57.1)	11
Total ..	4,488	176	60	2,101 (47.8 ± 0.74)%	102 (56.7 ± 4.46)%	29

Difference between Hindus and Muslims is statistically significant at 5% level, the value being 8.9 ± 4.52.

FIG. 4.—Comparative incidence of cancer in various sites: Cancer Hospital of Calcutta, Calcutta, India, and the Royal Marsden Hospital, London, England.

tribution of cancer is not the same everywhere. The adjoining percentage distribution diagram (Fig. 4) shows the comparative incidence of cancer in different sites of two institutions, namely, the Chittaranjan Cancer Hospital of Calcutta and the Royal Marsden Hospital of London. The preponderance of oral, laryngeal and cervical cancer is very definitely marked in India. During the period of five years from 1954 to 1958, 4,258 female malignant cases were detected having cancer in different parts of the body of which 483 (11.3%) were cancer of the breast, 2,420 (56.8%) of the female genitalia, 2,135 (50.1%) of the cervix, and only 61 (1.4%) of the body of the uterus. Thus, for each cancer of the breast, there are four cancers of the cervix and for each cancer of the body of the uterus, there are 35 cases of cancer of the cervix.

Cancer of the cervix was believed to be rare among the Mohammedan women but the experience of the author is otherwise. The comparative incidence of cancer of the cervix between the

Hindus and the Mohammedans has been worked out by the author. Tables 3 and 4 indicate that the incidence is practically the same between the two communities, the difference noted not being statistically significant. This leads us to presume that it is not the ethnological difference but the habits and environments, social status and assaults on the cervix due to repeated child births which are responsible for the frequency of cancer of the cervix in one or the other community.

Recently there has been a great move all over the world to screen adult women free from any suggestive symptoms of malignancy with a view to finding out cases of early cancer. We have started similar type of work here at the Chittaranjan Seva Sadan and Chittaranjan Cancer Hospital with a view to finding out the incidence of unsuspected cancer of the cervix.

The number of women screened was 3,458, of which 2,966 had some gynaecological symptoms not suggestive of malignancy, 149 were without any symptom, 316 and 27 being in the early and late months of gestation respectively.

Altogether, 9,044 smears were taken, 6,916 being primary and the rest repeat.

Cancer of the cervix was detected by smear technique and confirmed by biopsy in 18 cases, having a prevalence rate of 0.52%, 12 of them being invasive and the rest intraepithelial. If only the invasive cases are taken into consideration, the prevalence rate becomes 0.34%. This percentage meets with the general agreement with other workers in different parts of the globe.

Since the 1958 Congress of the International Federation of Obstetrics and Gynaecology, the classification of cancer of the cervix has been altered. Stage O, i.e. non-invasive intraepithelial cancer, is no longer classified under the general classification in cancer of the cervix. The classification as modified and accepted by that meeting is as follows:

Stage I. The carcinoma is strictly confined to the cervix.

Group Ia—Preclinical carcinoma or less than 1 cm. in diameter.

Group Ib—A carcinoma 1 to 5 cm. in diameter.

Group Ic—A carcinoma more than 5 cm. in diameter. The growth has extended to the corpus.

Stage II. The carcinoma involves the vagina but not the lower third. The carcinoma infiltrates the parametrium but has not reached the pelvic wall.

Group IIa—Carcinoma encroaching upon the vaginal wall, but not obviously infiltrating the parametrium.

Group IIb—Carcinoma infiltrating the parametrium.

Stage III. The carcinoma involves the lower third of the vagina. The carcinomatous infiltration of the parametrium has extended into the pelvic wall, when on rectal examination the infiltration feels firm and nodular and there is no smooth 'cancer-free' space between the tumour and the pelvic wall. A swelling on the pelvic wall, not attached to the tumour, should not be considered in the staging.

Stage IV. The carcinoma involves the bladder or the rectum, or has extended outside the true pelvis, i.e. below the vaginal inlet or above the pelvic brim (distant metastases).

Group IVa—Clinical invasion of the bladder or rectum.

Group IVb—Histologically proved invasion of the bladder or rectum, ulceration or fistulae. Extension of the carcinoma outside the true pelvis.

Only cases of invasive carcinoma should be included. The staging should be performed prior to the treatment and should not be changed. It is desirable that the staging should be carried out under anaesthesia. Findings at urography or venography or at surgery should not influence the staging.

I have already pointed out that cancer of the body of the uterus is very rare in my series, the ratio between the cancer of the body of the uterus to that of the cervix being 1 : 35. So far as my information goes, cancer of the body of the uterus is rare all over India, although in Western countries and even in Japan the incidence is much higher.

In order to ascertain the incidence of unsuspected cancer of the body of the uterus among adult females above the age of 35, 2,037 patients from the polyclinic of the Chittaranjan Seva Sadan were screened by taking vaginal and intrauterine aspiration smears. Altogether 6,394 smears were taken including repeat examinations. Smear was positive in ten cases and endometrial biopsy proved cancer of the body of the uterus in nine, thus giving a prevalence rate of 0.44%. It has been noted previously that screening of an unsuspected group for cancer of the cervix gave us a prevalence of 0.34%, showing thereby that amongst the unsuspected group with minimal symptoms the prevalence rate of the cancer of the cervix and cancer of the body of the uterus is almost the same. It will have to be worked out why at a later stage, cases of the cancer of the body do not present themselves for treatment. It might be that the growth of the cancer in the body of the uterus is less rapid than in the cervix and before the growth is well established, a good number of these patients die of some other disease.

Special Surgical Technique

I present a new surgical operation for the treatment of cancer of the cervix with the five-year end-results.

In 1931, when I submitted my five-year statistical end-results of cancer of the cervix treated with radiation therapy, at the Third International Radiological Congress, I was very much impressed to find continental surgeons performing radical vaginal hysterectomies in similar cases.

Radiation therapy has already been accepted by us but surgical treatment has been reintroduced and is gaining popularity because of the limitations and hazards of radiation therapy.

I was more or less satisfied with Schauta's operation, which I had been doing for more than a quarter of a century; but my complacency had a good shaking when I presented the results of Schauta's operation at the Royal Society of Medicine in 1947. The only criticism I had to face was that in Schauta's operation pelvic nodes were ignored. Since then I have worked long hours in the Anatomical Dissection Hall and in the post-mortem room with a view to making the Schauta's operation a complete one. During this period I had an opportunity of making anatomical dissections of the different layers of pelvic tissues with Prof. Amreich of Vienna on different occasions.

The operation starts with the extraperitoneal dissection of pelvic nodes, ligation of ovarian and uterine vessels and partial mobilisation of parametria and finally ends with the radical vaginal hysterectomy with massive removal of parametria.

This new operation has stood the test of time not only in my hands but also in the hands of other experts including my colleagues and assistants. It has been demonstrated in many university clinics here and abroad, and I had the greatest satisfaction when in 1952 I demonstrated this operation at the Schauta Klinik of the University of Vienna through the courtesy of the Director, Professor Antoine. Incidentally, the patient I operated on at the Schauta Klinik has passed through a five-year check-up and is doing well.

The criticism has been made that my operation requires three cuts.⁸ The two inguinal incisions could have been reduced to one by making a Pfannenstiel's incision but that would only cut more healthy tissues unnecessarily.

In some of Stage II (vagina) cases, where the growth has extended down in the vagina and of Stage III cases where there is a metastatic isolated growth in the lower part of the vagina, extensive dissection of the vagina will be necessary and this can better be done by the vaginal route. Abdomino-perineal operation is not a new thing in

cancer surgery, especially for cancer of the rectum; and lately for advanced cervical cancer in Brunschwig's exenteration operations. Even in Wertheim's operation, in cases where the lower third of the vagina is involved in carcinoma, Wertheim used to advocate 'the pull-through method by extensive dissection of the vaginal introitus and extraction of the specimen from below'.²¹

It was stated some time back that surgery has reached its limits in dealing with cancer of the cervix and there was no scope for further improvement. This statement was made when radiation therapy for cervical cancer was at the height of its glory.

Curiously enough, the surgical treatment has been reintroduced with great improvements. It has gained ground not only for the treatment of Stage I and II cases but also for Stage III and even Stage IV cases.

The limits of radical abdominal or radical vaginal hysterectomies for cervical cancer have been extended today beyond those originally designed by Wertheim and Schauta. There are newer approaches to make the Schauta's operation comparable to Wertheim's and new addenda to pelvic surgery, namely, the exenteration operation for advanced cancer of the cervix.

It is not known whether the same difference of opinion exists today about the radical abdominal and radical vaginal operations as when both Wertheim and Schauta did their operations in Vienna, towards the end of the 19th century, as contemporary gynaecological surgeons. Their overall results did not show any remarkable difference.

Since then, the radical operations of both varieties became popular all over Europe. In fact, in some of the clinics, one division used to do Wertheim's operation and the other division the Schauta's operation. The end-results of both these operations were almost identical.

In the United Kingdom, Victor Bonney, the master-surgeon of the time, took up Wertheim's operation. His technique was superb and end-results quite satisfactory, so that it became the treatment of choice among British gynaecologists. The orthodoxy of some British gynaecologists sometimes becomes obvious. Dr. Aleck W. Bourne³ remarks: 'The Schauta extended vaginal hysterectomy will not be considered . . . since it is almost never done in this country'. The results of Walter Stoeckel,¹⁹ who was a contemporary of Victor Bonney,² indicate that the British gynaecologists would not have been much worse off had they followed Schauta's radical hysterectomy.

During the last two decades, Dr. Meigs has

revived Wertheim's operation and made it popular among American gynaecologists. It is apparent that the influence of Ries and Clark was in the background. Before he took up Wertheim's operation in real earnest, he consulted Victor Bonney of England and Warnekros of Dresden. Can it not be guessed that if, instead, he happened to consult Stoeckel in Berlin and Amreich in Vienna, Dr. Meigs might have adopted the Schauta operation and through his perfect surgical acumen and dexterity given us an equally good model series minus the complications from his Wertheim series?

I take the liberty of making such a statement because of my continued practice of the Schauta operation for the last 28 years.

While practising the Schauta operation, I had to face criticism from many quarters. The present surgical approach, namely, Extraperitoneal Pelvic Lymphadenectomy and Radical Vaginal Hysterectomy, is the outcome of the reactions which I had to face. It can be reasonably said that this new operation has by now proved its worth as evidenced by its effective massive removal of the cancer-bearing tissues as well as by satisfactory five-year end-results.

I have a feeling that this operation can be done with success and with sufficient security in all types of patients irrespective of age, weight and general nutrition. There is only one proviso: the surgeon must not only know the surgical anatomy of the pelvis but also be thoroughly trained in pelvic surgery. This kind of surgery is not meant for occasional surgeons but for those who have taken it as their life study, who are regularly engaged in practising this very type of surgery and who in their spare moments gather more experience of pelvic structures from the anatomy hall or the post-mortem room. Thus an operator acquires a vivid clear cut mental picture of different pelvic structures which he will have to handle while doing this operation. While operating, the operator actually feels as if he is turning over the pages of the surgical anatomy and the completion of each operation is a reward by itself.

It is a moot question why I took up the surgical treatment in addition to radiation therapy. To begin with, I used to treat all cases with radiotherapy as was usually the custom during the earlier part of this century. My first five-year end-results, though not very encouraging, were presented at the Third International Radiological Congress in Paris in 1931. It was 16.6%.⁹ After that I took up surgery along with radiotherapy for the treatment of cancer of the cervix. The results of radiotherapy improved no doubt in course of time, and with the addition of supervolt therapy, but the results of surgical treatment were

definitely better than radiotherapy. Table 3 shows the comparative five-year end-results of Stages I and II cases during the years 1950 and 1951. They are 47.4% and 65.6% for radiotherapy and surgery respectively (Table 5).

TABLE 5
CANCER OF THE CERVIX, STAGES I AND II
COMPARATIVE FIVE-YEAR END-RESULTS

Years	Radiotherapy		Surgical Treatment	
	Total No. Treated	Cure Rate	Total No. Treated	Cure Rate
1950 and 1951	78	47.4%	32	65.6%

I have not yet been in a position to select my cases on the basis of radio-resistance and radiation response. We have tried to assess the radiation response of cervical cancer cases by studying the reaction of different types of cells (resting, mitotic, differentiating and degenerative) from 'young tumour foci' after the first radiation exposure (7,000r). Our results do not correspond with those of Glucksmann and Spear.⁴ In our series the radiation response has been found much the same in all cases at the end of the first week after radiation. The percentage count showed an increase in the proportion of degenerating and differentiating cells and a corresponding decrease in the proportion of mitotic and resting cells uniformly in *all* cases.¹¹ Hence we could not predict radio-resistance after initial radiation in the way suggested by Glucksmann and Spear.⁴

Heyman⁵ does not believe that any group of cervical cancer is specially radio-resistant but he considers that some tumours are more malignant than others. This varying degree of malignancy is detected from clinical experience and cannot be substantiated by microscopical evidence. Although valuable contributions have been made by Glucksmann and Ruth Graham in this direction, the real clue to the varying degree of malignancy is yet to be found.

Under the circumstances, the selection of my cases for surgical treatment was based on operability. I was not particular in selecting a model series of thin, comparatively young women with an ideal picture of health and having a small circumscribed growth in the cervix. My cases were recruited both from thin and obese patients, and from Stages I, II and III groups. Malnutrition was rather a marked feature in most of my cases. Only those cases were taken up who willingly submitted themselves for operation, the remaining cases being treated by radiotherapy.

In 1932, I started surgical treatment in addition to radiation therapy. Prior to this period, Wertheim's radical abdominal operation was tried with an enormous primary mortality. This was partly due to the devitalised conditions of patients undergoing operation. Anaemia, low blood volume and a hyposthenic condition were usual in such cases. So, instead of taking up the radical abdominal operation, I preferred the radical vaginal method. Although antibiotics and sulfa drugs were not introduced early in the series and blood for transfusion was not easily available, I was much impressed with a remarkably low primary mortality,¹⁰ which in the last 105 cases was nil, although taking all the cases together it was 2.8%.¹²

During the last 10 years, a total number of 216 cases of cancer of the cervix have been operated on by the new technique, although the total number of radical vaginal hysterectomies so far done here and abroad amounts to 450. Out of 216 cases dealt with by the new technique, 194 cases were operated by the author and the rest by his colleagues and assistants. When classified stage by stage, 114 belonged to Stage I, 80 to Stage II and 22 to Stage III.

The *primary mortality* of my new series was 3.6%. Unfortunately, we had a few accidental deaths due to malignant tertian malaria, haemolysis after blood transfusion and opium poisoning. If these are excluded, the corrected mortality becomes 1%. There was no primary mortality for the last 55 cases.

Post-operative bladder troubles were remarkably few, the residual urine being reduced to about 2 oz. within an average of 10-12 days.

There was no ureteric fistula in this series. Two patients had vesico-vaginal fistulae, both having had previous radium treatment in another hospital.

Associated Pelvic Lesions such as of tubo-ovarian masses, ovarian or pelvic endometriosis or uterine tumours are said to cause difficulties in radical vaginal operations. Out of 450 radical vaginal hysterectomies done by me including the new series, tubo-ovarian masses were encountered in 18 cases, ovarian endometriosis in 5, uterine fibroids in 7, pyometra in 13 cases and uterine pregnancy in 4 cases. Table 6 gives the detailed list of associated pelvic lesions. Fig. 5 shows a cancer of the cervix Stage II with pregnancy of 16 weeks' duration. There was no difficulty in removing these associated secondaries along with the malignant uterus by the vaginal route. With my new technique, removal of these associated pelvic lesions has been greatly facilitated by the extraperitoneal ligature of ovarian and uterine vessels.

TABLE 6
PELVIC LESIONS ASSOCIATED WITH CERVICAL CANCER
CASES OPERATED

Total No. of Operations	Associated Pelvic Lesions
Radical vaginal hysterectomies (new series included) .. 450	Multiple fibroids .. 7
	Tubo-ovarian masses .. 18
	Ovarian endometriosis .. 5
	Hydrosalpinx .. 3
	Pyometra .. 13
	Dermoid cyst .. 1
	Ovarian cyst .. 1
	Other conditions .. 7
	Pregnancy .. 4

Pelvic lymph nodes are removed as far as practicable—mostly by the extraperitoneal route and some (paraureteric nodes) by the vaginal route. It is not possible to remove all the lymph nodes, big or small, from the pelvis. That is why, perhaps, Wertheim used to remove only the palpable nodes and Schauta did not attempt to remove any. Amreich,¹ quoting a study of pelvic nodes by Riffenstahl, has shown that there are at least two inaccessible groups of glands in connection with the cervix, namely, (a) glands situated at the most lateral part of Mackenrodt's ligament, the connecting lymph vessels accompanying the inferior gluteal artery and the pudendal vessels, and (b) pararectal glands which remain under the rectal fascia and whose lymph channels accompany the haemorrhoidal vessels. These two groups cannot possibly be removed by any operation, nor could they be effectively sterilized by radiation. I had difficulties in two cases, each belonging to Stage I. In both these cases, none of the glands removed showed any metastatic cancer cells; but within six months after the radical operation, a nodular growth was found in each case in the pelvis in the neighbourhood of the ischial spine. This might be from one of the inaccessible groups of lymph nodes cited by Amreich.

Systematic removal of all the detectable lymph nodes was done in each of the whole series of 216 cases. Table 7 gives the incidence of cancer-positive nodes. In 22.6% of the total number of cases, positive nodes were detected, which breaks up into 15.8% in Stage I, 27.5% in Stage II and 41% in Stage III.

Further analysis shows that the internal iliac and obturator nodes were most commonly affected. Recently I have started removing the lower lumbar group of glands (para-aortic) by extending upwards the left extraperitoneal incision. No evidence of metastases in this para-aortic group of glands was found in 25 cases so far operated on, except in two cases, belonging one to Stage III and another to Stage II. The latter case, although it belonged to the clinical Stage II,

FIG. 5.—Cancer of the cervix associated with pregnancy of 16 weeks' duration. Removed by radical vaginal hysterectomy.

had nine positive nodes out of 13 glands removed.

TABLE 7
INCIDENCE OF CANCER-POSITIVE NODES

Stages	No. of Cases	Cancer-Positive Glands	Percentage
I, II and III ..	216	49	22.6
I	114	18	15.8
II	80	22	27.5
III	22	9	41.0

Parametrial Infiltration.—It has been found by serial sections of the parametrium that only in 32 out of 216 cases were the parametria infiltrated with cancer cells either in the proximal, middle or in the distal third from the uterine side. Thus parametria were found infiltrated with cancer cells in 14.7% of the total number of cases operated on while the nodal involvement was found in

22.6% in the same series (Table 8). Further analysis of our data indicates that in only 14 cases were both the parametrial and the pelvic nodes infiltrated simultaneously. This shows that whatever may be the clinical staging, one is not justified in limiting the surgery in any stage of cancer of the cervix except, of course, in Stage 0 which has not been included in this series.

Evaluation of Five-Year End-Results

The acid test of a new technique is shown not only by the extensive and successful removal of the

TABLE 8
PARAMETRIUM INFILTRATION AND PELVIC NODE METASTASIS

No. of Cases Operated	Parametrium Infiltrated	Pelvic Node Metastasis
216	32 (14.7%)	49 (22.6%)

TABLE 9
FIVE-YEAR END-RESULTS OF CANCER OF THE CERVIX TREATED SURGICALLY BY MITRA'S TECHNIQUE

Year under Review	Total No.	Stages	Five-year Salvage		Lost Sight of
			No.	Percentage	
1949-53	57 38 12 7	I, II and III I II III	35 35 7 3	61.4 65.9 58.3 42.8	5.5%
				64	

TABLE 10
FIVE-YEAR END-RESULTS OF CANCER OF THE CERVIX TREATED SURGICALLY BY MITRA'S TECHNIQUE

Year under Review	Total No.	Stages	FIVE-YEAR SALVAGE	
			No.	Percentage
1949-51	20 16	I, II and III I and II	14 12	70 75

cancer bearing tissues but also by the evaluation of five-year end-results. The materials at hand are not large but may be taken to be sufficiently representative. During the years 1949 to 1953, 57 cases belonging to Stages I, II and III were operated on by the new technique, yielding an overall five-year cure rate of 61.4%. By breaking down the results, 64% has been salvaged from Stages I and II cases (Table 9). Stage I results of 1952 have been vitiated by a few accidental deaths by malignant tertian malaria, opium poisoning and haemolysis after transfusion of blood.

Five-year end-results were satisfactory in the first series covering the period 1949 to 1951, yielding 75% five-year cure in Stages I and II (Table 10).

Comparing the results of the present series treated by the new technique with those of my previous cases treated by Schauta's operation, it can be seen that the results of the present series (61.4%) are better than those of the older one (44.5%) (Table 11).

Five-year end-results have also been calculated on the basis of cancer-positive and cancer-negative

pelvic nodes in the new series. There was 73.8% five-year cure rate in gland-negative cases against 26% in gland-positive ones (Table 12). In the previous series of 1949-51, five-year salvage of gland-negative cases was 84.6%.¹³ Unfortunately, the percentage of gland-negative cases has been vitiated by a new accidental death in 1952. Prognosis in gland-metastasis cases is unfavourable. But the result that even in cases with metastases 26% had a five-year cure, when regional lymph nodes were sufficiently excised, encourages the surgeons and shows the importance of lymphadenectomy.

Supervolt radiotherapy is given as a routine treatment to these cases where there is parametrial or nodal metastasis.

Conclusion

The rational conclusion I can draw from my experience is that this new operation satisfies all the essential conditions for the radical surgery of cancer of the cervix. This operation can be done with reasonable safety even in the aged, comparatively bad surgical risk cases and in heavy corpulent patients. Besides, there is an additional advantage of the rehabilitation of the prolapsed bladder after the extensive removal of the vagina. There are fewer post-operative complications, both immediate and remote. There is no ureteric fistula, and bladder troubles are minimal. The end-results are satisfactory.

Stump carcinoma, vaginal carcinoma and cancer

TABLE 11
COMPARATIVE FIVE-YEAR END-RESULTS OF CANCER OF THE CERVIX TREATED BY MITRA'S TECHNIQUE AND BY THE SCHAUTA OPERATION

Years under Review	Type of Operation	Total No. and Stages	Five-year Salvage		Lost Sight of
			No.	Percentage	
1943-51	Schauta technique	74 I, II and III	33	44.5	
1949-53	Mitra technique	57 I, II and III	35	61.4	5.5%

TABLE 12
FIVE-YEAR END-RESULTS IN CANCER-POSITIVE LYMPH NODES

Year	Type of Operation	Pelvic Nodes					
		Negative			Positive		
		Total No.	Five-year Salvage		Total No.	Five-year Salvage	
			No.	Percentage		No.	Percentage
1949-53	Mitra technique	42	31	73.8	15	4	26

of the body of the uterus can be electively operated on by this new technique.

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