CHAPTER-5

Results...
RESULTS

BRAIN TUBERCULOMA
5.1 AREA OF INTAKE

Since cases were referred from tertiary referral hospitals, the intake for the brain tuberculoma study was widespread. Patients came from Madras city from other districts of Tamil Nadu and also from Andhra Pradesh State. Thus the area of intake was spread over a radius of up to 250 kilometers.

5.2 STUDY PERIOD

A total of 183 cases were referred for the study over a period of 47 months, (152 cases from Govt. General Hospital, Madras and 31 cases from Southern Railway Head Quarters Hospital, Madras). From among the referrals, 144 cases were included in the study.

The present analysis is confined to the histopathologically proven 11 cases plus 19 cases where there was bacteriological and/or histopathological evidence of extra cranial tuberculosis. Thus a total of 30 patients form the study population.
5.2.1 Age-Sex distribution: Table-5.1.1 describes the age and sex distribution of 30 patients of brain tuberculoma in the analysis. Twelve patients (40%) were less than 12 years of age and 9 (30%) were between 13-20 years of age. The majority of the study population was in the age group of 5-20. There were 15 females and 15 males and the male to female ratio was 1:1. Among 12 children 3 were females.

5.2.2 Symptoms: The main symptoms observed were convulsions (50%), headache (63%) vomiting (60%), limb weakness (37%), visual disturbance (40%) and unsteady gait(10%) (Table-5.1.2). Regarding the number of complaints 17% of patients had a single complaint, 29% had two, 30% of patients had 3 and 25% of patients 4 or more.

5.2.3 Duration Of Symptoms: The duration of symptoms, was from a few days to a few years. Among 16 patients with multiple lesions, the duration was very short, ie, in 4, less than 15
TABLE-5.1.1 Age & sex distribution

<table>
<thead>
<tr>
<th>Age</th>
<th>Female</th>
<th>Male</th>
<th>Total No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - 10</td>
<td>3</td>
<td>7</td>
<td>10</td>
<td>33</td>
</tr>
<tr>
<td>11 - 18</td>
<td>5</td>
<td>4</td>
<td>9</td>
<td>30</td>
</tr>
<tr>
<td>19 - 25</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>26 - 30</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>31 - 40</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>41 &amp; above</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>15</td>
<td>30</td>
<td>100</td>
</tr>
</tbody>
</table>
### TABLE-5.1.2 Symptoms of brain tuberculoma
(Total No. of Pts. 30)

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Patients</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convulsions</td>
<td>8</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Headache</td>
<td>12</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Conv. &amp; Headache</td>
<td>7</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Vomiting</td>
<td>18</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Limb weakness</td>
<td>11</td>
<td>37</td>
<td></td>
</tr>
<tr>
<td>Fever</td>
<td>7</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Visual disturbance</td>
<td>12</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Unsteady gait</td>
<td>3</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>
days, in 5, between 15 days-3 months, in 3 from 91-180 days and in 4, for more than 181 days. Of the 14 patients with single lesions, the onset was of less than 15 days in 2, 16 days to 90 days in 6, 91-180 days in 4 and more than 181 days in 2.

5.2.4 Type of onset and Progress: The onset of neurological illness is usually classified under sudden or insidious onset and the progress is described as rapid or slow.

a) Onset: In this study, in the majority, the onset was sudden. Slow or insidious onset was seen in less than 25%.

b) Progress: Progress of the illness was rapid in 6 of 16 cases who had multiple lesions as against 6 of 14 in patients who had single lesions. Patients who presented with convulsions and or limb weakness took medical advice at an early date (in less than one week), compared to patients who complained of headache or poor performance in school etc. Among patients in the paediatric age
group, visual disturbance was missed by parents. At the time of admission 3 of 12 children were nearly blind. Likewise cerebellar ataxia in children was also not taken seriously by patients and attending physicians and was investigated rather late.

5.3 FINDINGS ON GENERAL EXAMINATION

All patients went through a detailed general and neurological examination. General examination revealed lymphadenopathy in two, hepatosplenomegaly in one, febrile episodes in 10, altered sensorium requiring emergency shunt surgery in 4 patients.

5.4 FINDINGS ON NEUROLOGICAL EXAMINATION

On examination patients were classified based on the presence or absence of signs as:

a) Normal or no abnormal signs on admission: The significant findings in this study was 9 (30%) patients were clinically normal and there was no neurological deficit. Among the remaining
70% of patients, neurological deficits were observed.

b) Papilloedema alone: Five (17%) of the patients had only papilloedema.

c) Deficit alone: In 3 (10%) of the patients various deficits like 3rd nerve palsy, 6th nerve palsy and cerebellar ataxia were found.

d) Papilloedema with deficit: 13 (43%) of the patients had papilloedema in addition to some other neurological deficits like hemiparesis, UMN facial palsy and dysphasia.

5.5 EVIDENCE OF ASSOCIATED TUBERCULOSIS

5.5.1 Associated Pulmonary tuberculosis:
Thirteen (43%) of the patients had abnormal findings on x-ray chest suggestive of Pulmonary tuberculosis. The shadows were suggestive of miliary lesion in 2 (7%), inactive or fibrotic in 8. In two of the patients sputum culture was found to be positive for Mycobacterium tuberculosis. One culture was found to be
sensitive to INH, streptomycin and rifampicin and the other one was resistant to the same three drugs.

5.5.2 Renal tuberculosis: Urine culture for M. Tuberculosis was positive in 2 (7%) patients and negative in the remaining 28 patients.

5.5.3 Glandular tuberculosis: Lymph node biopsy was done in two cases and the histopathological findings were suggestive of tuberculous lymphadenitis.

5.5.4 Disseminated Tuberculosis: In two cases of disseminated tuberculosis, liver biopsy was done and the histopathology was suggestive of tuberculosis. Thus in 19 patients extra neural tuberculosis was observed.

5.6 HISTOPATHOLOGICALLY VERIFIED TUBERCULOMAS

Of 30 cases in the analysis 11 cases had histopathological confirmation of tuberculoma. Culture was positive in 1 and not available in the remaining 10. Thus of the total 30 patients in
analysis, 11 had histopathologically verified tuberculoma of brain and 19 had evidence of extra-neural tuberculosis.

5.7 CHEMOTHERAPY

Patients admitted to the study were randomly allocated to one of the treatment groups. 18 (60%) of patients received 3RHZ daily/6RH2 (Group A) and 12 (40%). Patients received 3RHZ thrice weekly /6RH2 (Group B). The pretreatment characteristics in the 2 treatment groups are described in Table 5.1.3.

5.7.1 Chemotherapy Received: Ninety five percent in group A and 94% in group B received 90% or more of the prescribed chemotherapy. 27% received 100% treatment and all patients received at least 63% of prescribed chemotherapy.

5.8 HOSPITALIZATION AND DISCHARGE

All the patients were hospitalized for the first 15 days of treatment. Patients who had clinical signs of increased ICT, who required surgery, who had
### TABLE-5.1.3 Distribution of patients in 2 treatment regimens

<table>
<thead>
<tr>
<th></th>
<th>Group A</th>
<th>Group B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 - 18</td>
<td>9</td>
<td>50</td>
</tr>
<tr>
<td>19 - 39</td>
<td>6</td>
<td>33</td>
</tr>
<tr>
<td>40 and above</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F</td>
<td>7</td>
<td>39</td>
</tr>
<tr>
<td>M</td>
<td>11</td>
<td>61</td>
</tr>
<tr>
<td><strong>No. of lesions</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>7</td>
<td>39</td>
</tr>
<tr>
<td>2 lesions</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>3 or more</td>
<td>7</td>
<td>39</td>
</tr>
<tr>
<td><strong>% of Rx. received</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90% &amp; above</td>
<td>17</td>
<td>95</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>18</td>
<td></td>
</tr>
</tbody>
</table>
poorly controlled seizure and who came from long distances were hospitalized for more than 15 days. After recovery, local patients attended TRC twice a week for drug collection and out station patients were supplied drugs once in 15 days.

5.9 CT SCAN FINDINGS

The CT scan findings are described under the following headings: No. of lesions, site and size of lesions, morphology of the lesions, enhancement with contrast, brain oedema, evidence of mass effect in CT scan and calcification.

5.9.1 Total number of CT scans done: In this study a total of 124 scans were done for 30 patients during a period of 5 years, an average of 4 per patient. Initial scans were done in all 30 cases.

5.9.2 Morphology of lesion: Among the initial 30 scans, 14 had single lesions and 16 multiple lesions. The morphological appearance varied from disc lesions to ring lesions depending on
the stage of the disease. Of 14 single lesions the majority were disc and ring lesions and the remaining were other types like cortical tuberculomas, or coalescence of multiple discs.

**5.9.3 Enhancement with contrast:** The CT attenuation value ranged from 16.7 HU to 65.5 HU in plain scans and from 17.0 HU to 93.6 HU in contrast enhanced scans.

**5.9.4 Brain oedema:** Accompanying brain oedema was present in a total of 80% of cases. In 3% of cases, the oedema was of grade-III, in 33% moderate and in 43% mild.

**5.9.5 Number of lesions:** The number of lesions observed in the initial scan among 30 patients is shown in Table 5.1.4. Thus 14 (47%) had single lesions and 16 (53%) had multiple lesions. Among patients with multiple lesions, 6 had 2 lesions, 4 had 3 lesions, 1 each had 4, 5 and 8 lesions and 3 patients had 9 lesions.
<table>
<thead>
<tr>
<th>Number of lesions</th>
<th>No. of patients</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>14</td>
<td>47</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>13</td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
5.9.6 Site of lesions: Table-5.1.5 describes the site of initial lesions in 30 cases including both single and multiple lesions. Among single lesions cerebellum 5 (36%), frontal 4 (29%), and parietal 3 (21%) were the main areas of involvement. Among multiple lesions parietal 14 (88%), frontal 10 (63%), occipital 8 (50%) and temporal 5 (31%) and cerebellar 5 (31%) were the predominant sites of involvement. Majority of the cases had parietal lesion. Tuberculoma were also found in rare sites like thalamus, parasagittal and brain stem.

5.9.7 Size of lesion: In 3 (10%) (single lesion 2, Multiple 1) of the patients, lesions were less than 15 mm and in 8 (27%) (single lesion 3, Multiple 5) it was 16-20 mm, in 4 (13%) (single 2, Multiple 2) between 21-25, in none between 26-30 and in 15 (50%) (single 7, Multiple 8) between 31-55 mm size.
TABLE-5.1.5  Site of lesions in 30 cases

<table>
<thead>
<tr>
<th>Treatment with Site</th>
<th>No.</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Lesion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cerebellar</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>Frontal</td>
<td>4</td>
<td>24</td>
</tr>
<tr>
<td>Parietal</td>
<td>3</td>
<td>21</td>
</tr>
<tr>
<td>Temporal</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Mid brain</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>Total Patients</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Multiple Lesion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parietal</td>
<td>14</td>
<td>88</td>
</tr>
<tr>
<td>Frontal</td>
<td>10</td>
<td>63</td>
</tr>
<tr>
<td>Occipital</td>
<td>8</td>
<td>50</td>
</tr>
<tr>
<td>Temporal</td>
<td>5</td>
<td>31</td>
</tr>
<tr>
<td>Cerebellar</td>
<td>5</td>
<td>31</td>
</tr>
<tr>
<td>Other sites</td>
<td>26</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>100</td>
</tr>
</tbody>
</table>


5.9.8 **Mass effect:** It was observed that the majority had minimal mass effect. Mass effect was found in 20 (67%) initial scans, grade I in 14 (47%) and grade II in 6 (20%). In 10 (33%) patients no mass effect was observed.

5.9.9 **Clinical status and number of lesions:**
The signs and clinical status in relation to number of lesions is given in Table-5.1.6. Among 16 patients with multiple lesions, 13 (81%) presented with papilloedema or deficit as against 8 (57%) among patients with single lesions. Thus, the development of ICT and or deficit was observed to be higher among patients with multiple lesions.

5.9.10 **Clinical presentation according to age** in Table- 5.1.7. The proportion of patients who clinically presented with papilloedema and deficit among patients with multiple lesions was higher (82%) when compared to patients with single lesion (58%). Of the total 30 patients 21
**TABLE-5.1.6 No. of lesions Vs Clinical Status**

<table>
<thead>
<tr>
<th>Number of lesions</th>
<th>Clinical Status</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N* (%)</td>
<td>D*(%)</td>
<td>P*(%)</td>
<td>PD*(%)</td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single lesion</td>
<td>6 (43)</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple lesions</td>
<td>3 (19)</td>
<td>1</td>
<td>5</td>
<td>7</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>9 (30)</td>
<td>3 (10)</td>
<td>5 (17)</td>
<td>13 (67)</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: N = Normal  D = Deficit  P = Papilloedema  PD = Papilloedema and Deficit*
<table>
<thead>
<tr>
<th>Age group</th>
<th>Normal</th>
<th>PAP/Def.</th>
<th>Normal</th>
<th>PAPDef.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-12</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>13-20</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>6</td>
<td>9</td>
</tr>
<tr>
<td>21-30</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>31 &amp; above</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>6 (43%)</td>
<td>8 (58%)</td>
<td>3 (18%)</td>
<td>13 (82%)</td>
<td>30 (100%)</td>
</tr>
</tbody>
</table>
patients presented with neurological deficit; the proportion of patients with deficit/papilloedema was higher among patients with multiple lesions. Among 12 children 7 had papilloedema/deficit as compared to 15 of 18 adults.

5.9.11 No. of lesions and Age group: The proportion of patients with single and multiple lesions is presented according to age group (Table 5.1.8). Thus the number of patients who presented with single lesions in the age group 5-12, 13-20, 21-30 and 31 and above was, 8, 3, 1 and 3 respectively and among patients with multiple lesions 4, 6, 5 & 1.

5.9.12 Montoux(Tuberculin) reaction and number of lesions: Among 19 patients with positive tuberculin reactions 9 had multiple lesions whereas among 10 Mantoux negatives, 7 had multiple lesions (Table 5.1.9).
<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Single Lesion</th>
<th>Multiple Lesion</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-12</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>13-20</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>21-30</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>31 &amp; above</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>16</td>
</tr>
</tbody>
</table>
**TABLE-5.1.9** No. of Lesions according to Mantoux induration

<table>
<thead>
<tr>
<th>Induration in mm to 1 TU</th>
<th>No.of lesions</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>One</td>
<td>Two/More</td>
</tr>
<tr>
<td><strong>+ve</strong> &gt;10mm</td>
<td>10</td>
<td>9</td>
</tr>
<tr>
<td><strong>-ve</strong> &lt;10 mm</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td><strong>Not done</strong></td>
<td>1</td>
<td>0</td>
</tr>
</tbody>
</table>

Total  | 14  | 16 |
5.10. RESPONSE TO TREATMENT

The assessment of response to antituberculous chemotherapy was based on clinical and CT scan progress during treatment and during follow-up.

5.10.1 Clinical Progress: The clinical progress at 2, 9, 24 and 60 months is described in Table 5.1.10. At 2 months excluding 1 death 29 patients and at 9 months excluding two more deaths 27 patients were available for follow-up. The reasons for deaths in these 3 cases were post-operative meningitis on the 12th day of start of treatment in case 1, shunt tube infection on the 75th day of treatment in case 2, and malnutrition on the 123rd day in case 3. The number of patients who had normal clinical status was 16 (57%) at 2 months, 22 (81%) at 9, 24 and 60 months. The number of patients with papilloedema dropped from 18 at initial assessment to 10 by 2nd month, 5 by 9th and 24th month. These 5 patients had residual post
<table>
<thead>
<tr>
<th>Clinical Status</th>
<th>0Mth</th>
<th>2Mth</th>
<th>3Mth</th>
<th>4Mth</th>
<th>6Mth</th>
<th>9Mth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>9</td>
<td>30</td>
<td>16</td>
<td>54</td>
<td>22</td>
<td>81</td>
</tr>
<tr>
<td>Pappil/ PPOA</td>
<td>5</td>
<td>17</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Deficit only</td>
<td>3</td>
<td>10</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pappil+ Deficit</td>
<td>13</td>
<td>43</td>
<td>7</td>
<td>2</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>100</td>
<td>29*</td>
<td>27*</td>
<td>27</td>
<td>27</td>
</tr>
</tbody>
</table>

Note: PPOA = Post papill. optic atrophy
* Excluding 3 deaths
papilloedemic optic atrophy at the end of treatment. Of the 3 patients who had deficit initially, 3 continued to have deficit at 2 months and by 9 months deficit cleared totally in all these patients. By 24th and 60th month, 22 continued to be normal, 3 had PPOA and 2 had residual neurological deficit.

5.10.2 Clinical status at 0, 2, 9, 24th month in single and multiple lesions: Table (5.1.11) describes the clinical status among patients with single and multiple lesions at 0, 2, 9, 24th months respectively. Among patients with single lesions, 37%, 69%, 83% & 83% and among patients with multiple lesions, 19%, 48%, 80% and 80% were clinically normal at 0, 2, 9 & 24th month respectively

5.11 SCAN PROGRESS
To monitor the scan progress the initial scan findings were compared with subsequent scans done at 2nd, 9th, 24th and 60th months. The scan
**Table 5.1.11 Clinical status at 0, 2, 9 and 24 months**

**Single lesions**

<table>
<thead>
<tr>
<th>Clinical status</th>
<th>0 mth No.</th>
<th>0 mth %</th>
<th>2 mth No.</th>
<th>2 mth %</th>
<th>9th No.</th>
<th>9th %</th>
<th>24th No.</th>
<th>24th %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>6</td>
<td>37</td>
<td>9</td>
<td>69</td>
<td>10</td>
<td>83</td>
<td>10</td>
<td>83</td>
</tr>
<tr>
<td>Pap/Defit/</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPOA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>14</td>
<td>13*</td>
<td>12**</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Case 53-death due to post OP meningitis on 12th day.

**Case 98-died on 75th day due shunt infection.

**Multiple lesions**

<table>
<thead>
<tr>
<th>Clinical status</th>
<th>0 mth No.</th>
<th>0 mth %</th>
<th>2 mth No.</th>
<th>2 mth %</th>
<th>9th No.</th>
<th>9th %</th>
<th>24th No.</th>
<th>24th %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>3</td>
<td>19</td>
<td>7</td>
<td>48</td>
<td>12</td>
<td>80</td>
<td>12</td>
<td>80</td>
</tr>
<tr>
<td>Pap/Defit/</td>
<td>13</td>
<td>9</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PPOA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>16</td>
<td>16</td>
<td>15*</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Case 30-Non TB death on 123rd day.
response of the lesion was classified as total disappearance, decrease in size to more than 50% of original size, decrease in size to less than 50% of original size, static, increase in size, calcification and fresh lesion.

5.11.1 CT progress at 2 months: Of 30 cases, scan results were available for 25 patients at 2 months and at for 27 patients at 9 months. Table 5.1.12. At the 2nd month, total disappearance of lesions was seen in 5 (20%) (3 of single lesions and 2 of multiple lesions), decreased to more than 50% in 12 (48%) (4 of single and 8 of multiple), decreased to less than 50% in 2 and static in 6.

5.11.2 CT progress at 9 months: At 9 months, total disappearance of lesion was seen in 19 (70%), decrease in size to more than 50% in (6%), static in 1 and new lesion in 1. Calcification of lesion was seen in 1.
Table 5.1.12 SCAN STATUS AT 2, 9 AND 24 MONTHS

Single lesion

<table>
<thead>
<tr>
<th>Month</th>
<th>Total No.</th>
<th>Dis- app.</th>
<th>Cal. Decreased &gt;50%</th>
<th>Decreased &lt;50%</th>
<th>Static</th>
<th>Not done</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>13</td>
<td>3</td>
<td>0</td>
<td>4</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>12</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>24</td>
<td>12</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Multiple lesion

<table>
<thead>
<tr>
<th>Month</th>
<th>Total No.</th>
<th>Dis- app.</th>
<th>Cal. Decreased &gt;50%</th>
<th>Decreased &lt;50%</th>
<th>Static</th>
<th>Not done</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>16</td>
<td>2</td>
<td>0</td>
<td>8</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>9</td>
<td>15</td>
<td>9</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>24</td>
<td>15</td>
<td>10</td>
<td>3</td>
<td>2</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
5.11.3 CT progress at 24 months: At 24 months, 20 patients had total clearance and 4 had calcification. If calcified lesions were considered as healed lesions and added to 'disappeared' lesions, 85% of patients had total clearance of lesions by 24 months.

5.11.4 Scan response of the two treatment groups: The response was similar in the two groups and there was no difference in response with respect to daily treatment or intermittent treatment.

5.11.5 Scan response in single and multiple lesions: Patients with single lesions show a more rapid clearance compared to patients with two or more lesions.

5.11.6 Calcification: Calcification was seen at the 9th month in one case (3%) and in 4 (15%) by the 24th month.

5.11.7 Progress of brain oedema: With ATT and steroids the lesions and the surrounding oedema
regressed. Initially 24 (80\%) of the patients had brain oedema. (Grade I 43\%, Grade II 33\% and Grade III 10\%). At 2 months only 8 (27\%) continued to have oedema (Grade I 7(23\%), Grade II 1(3\%) and Grade III nil. At 9 months 3(10\%) had brain oedema (Grade I 2(6\%) and Grade III 1(3\%).

5.11.8 Comparison of CT Scan and Clinical Status: Assessment of both CT scan picture and clinical status were available at the end of treatment for 27 of 30 patients. From the table 5.1.13, it is obvious that 20 of 27 (74\%) patients had both clinical and CT scan status normal at the end of treatment. Even though the clinical status was normal, CT scan continued to show the lesion in 2 of 27 (7\%) patients. In these patients however the scans improved without additional chemotherapy by 24 months. In 2(7\%) both CT and clinical status were abnormal at 9 months. In general, clinical improvement
**TABLE-5.1.13** Clinical status Vs CT status at the end of Treatment

<table>
<thead>
<tr>
<th>Clinical status</th>
<th>CT Status</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>Normal</td>
<td>20</td>
<td>67</td>
</tr>
<tr>
<td>Abnormal</td>
<td>Normal</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Normal</td>
<td>Abnormal</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Abnormal</td>
<td>Abnormal</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>27*</td>
<td>91*</td>
</tr>
</tbody>
</table>

* Excluding 3 deaths
was more rapid than CT scan clearance of the lesions during treatment.

5.12 SURGERY

All the surgical procedures performed were essentially designed to reduce ICT or to reexamine the initial diagnosis.

5.12.1 Time and type of surgery: Fifteen out of 30 underwent various surgical procedures (Table 5.1.14). 7 VP shunt, 10 craniotomy, 1 limited craniotomy biopsy and 1 stereotactic biopsy. The time interval ranged from -2 months to +17 months from the time of admission to the study. Majority of the patients had surgery within -2 month to +2 months of admission to study. Histopathological examination was positive in 11 patients.

5.13 OCCURRENCE OF ADVERSE REACTIONS TO TREATMENT AND THEIR MANAGEMENT:

Adverse Reactions including both major and minor were observed in 3 of 30 patients. The major
<table>
<thead>
<tr>
<th>Serial Number Patients</th>
<th>Type of Surgery</th>
<th>Time Interval from Date of admission to study</th>
<th>HPE Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Shunt</td>
<td>6 weeks</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Craniotomy</td>
<td>20 days</td>
<td>+ve</td>
</tr>
<tr>
<td>3.</td>
<td>a) Craniotomy</td>
<td>6 weeks</td>
<td>+ve</td>
</tr>
<tr>
<td></td>
<td>b) Shunt</td>
<td>+17 days</td>
<td>+ve</td>
</tr>
<tr>
<td>4.</td>
<td>Shunt -</td>
<td>14d</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Shunt - 2m</td>
<td>2m</td>
<td>+ve</td>
</tr>
<tr>
<td></td>
<td>Craniotomy</td>
<td>-19d</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Craniotomy</td>
<td>-26d</td>
<td>+ve</td>
</tr>
<tr>
<td>7.</td>
<td>Craniotomy Decompression</td>
<td>-33d</td>
<td>NA</td>
</tr>
<tr>
<td>8.</td>
<td>Shunt</td>
<td>-8w</td>
<td>+ve</td>
</tr>
<tr>
<td></td>
<td>Craniotomy</td>
<td>-18d</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Shunt</td>
<td>-3w</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Craniotomy</td>
<td>-22d</td>
<td>+ve</td>
</tr>
<tr>
<td>10.</td>
<td>Craniotomy</td>
<td>-22d</td>
<td>+ve</td>
</tr>
<tr>
<td>11.</td>
<td>Shunt</td>
<td>-19d</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Stereotactic biopsy</td>
<td>+11 weeks</td>
<td>+ve</td>
</tr>
<tr>
<td>13.</td>
<td>Craniotomy</td>
<td>+6 weeks</td>
<td>+ve</td>
</tr>
<tr>
<td>14.</td>
<td>Craniotomy</td>
<td>-10d</td>
<td>+ve</td>
</tr>
<tr>
<td>15.</td>
<td>Craniotomy excision</td>
<td>-20d</td>
<td>+ve</td>
</tr>
</tbody>
</table>
adverse reactions observed were hepatitis (10%) and vomiting. Jaundice or hepatitis was managed by withholding the following hepatotoxic drugs: rifampicin, INH and pyrazinamide and substituting them with streptomycin and ethambutol. Rifampicin was reintroduced 4 to 6 weeks after the return of liver function test to normalcy. The major adverse reaction necessitating drug interruption or termination was observed in 3 of Group A patients (daily regimen as against none in Group B (Intermittent regimen).

5.14 POST-TREATMENT FOLLOW UP

5.14.1 Sequelae

At the end of treatment, 5 patients were left with residual deficit. Blindness was seen in 3 children and one adult. Other deficits observed were minimal residual upper limb weakness, hemiparesis, cerebellar signs and UMN facial palsy.
5.14.2 Mortality: There were three deaths in this study.

5.14.3 Relapse
All patients were followed-up for a minimum of 5 years and a maximum of 7 years and during the follow up there were no relapses.

5.14.4 Major problems observed during post treatment follow-up

5.14.4.1 Convulsions: During the follow-up period, the major clinical problem encountered was convulsion. This occurred in 7 patients (38%) despite being put on anti convulsant. This was observed in patients who had surgery, who had initial neurological deficit or papilloedema and in children with multiple lesions. However, with regular and increased dose of anticonvulsant, seizures were brought under control. In these patients CT scans were normal except for calcification.
5.14.4.2 Shunt tube infection: Of the 7 patients who had VP shunt, one got infected and subsequently recovered.
RESULTS

POTT’S PARAPLEGIA
AREA OF INTAKE

POTT’S PARAPLEGIA

The patients admitted to this study were mainly from Madras city 18 (40%), other nearby districts of Tamil Nadu 19 (42%) and Andhra Pradesh 8 (18%).

5.20 PATIENT POPULATION

A total of 45 patients were assessed for the study in the orthopaedic department of the Government General Hospital, Madras during a period of 52 months. Of these, 10 were not eligible for various reasons like flaccid paraplegia, cauda equina tumour, late onset paraplegia and history of specific antituberculosis chemotherapy for more than 6 months. The remaining 35 patients were registered for the present study. Two patients were excluded from the analysis since the x-ray findings were not suggestive of active lesion in one patient and uncontrollable hypertension was found in the other patient. Thus, 33 patients were considered for the present analysis.

5.21 PRETREATMENT CHARACTERISTICS

5.21.1 Age and sex Distribution: Of the 33 admitted, there were 13 males and 20 females. Five were 10 years or less. Eight were between 11-20 years, 4 were between 21-30 yrs, 8 were 31-40 age group, 5 in 41 to 50 group, 4 were above 51 years. In this group 10 were children (Age less than 18
years). The minimum age was 3 years and maximum 65 years (Table 5.2.1).

5.21.2 **Investigations:** X-ray spine (Plate-8) was the main tool used in the diagnosis. Figure-5.2.1 describes the level of involvement of TB spine. Tuberculin test results are presented in Figure-5.2.2. The induration to 1TU was negative or (less than 10 mm) in 12 including 5 patients who had ‘0’mm induration and was positive (10 or more) in the remaining 19 patients. More than 30 mm induration was observed in 2 and in two patients mantoux test was not done. (Fig 5.2.2)

5.21.3 **Associated Tuberculosis:** The presence of tuberculous focus elsewhere was looked for in all these patients and the results were as follows.

a) **Urine culture:** Pre-treatment urine culture for *M. tuberculosis* was negative in all cases.

b) **Pulmonary tuberculosis:** Fifteen patients (45%) had x-ray abnormality suggestive of pulmonary tuberculosis. Of these 13 had parenchymal shadows and 2 had pleural thickening. However sputum smear was negative for acid fast bacilli (AFB) in all these 15 cases and cultures were also negative for *M. tuberculosis*.

5.22 CLINICAL FEATURES

5.22.1 **Symptomatology:** The various presenting symptoms and their duration is shown in table 5.2.2. The presenting symptoms were difficulty in walking, followed by inability to walk associated
FIG : 5.2.1
VERTEBRAE INVOLVEMENT IN SPINAL TB
(33 Patients)
FIG : 5.2.2 MANTOUX STATUS
(33 Patients)
**TABLE-5.2.1** Age and Sex Distribution of 33 Pott's Paraplegia patients

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 10</td>
<td>2</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>11 - 20</td>
<td>2</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>21 - 30</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>31 - 40</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>41 - 50</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>51 &amp; above</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>13</td>
<td>20</td>
<td>33</td>
</tr>
</tbody>
</table>
## TABLE-5.2.2 Duration of presenting symptoms (in months)

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Duration in months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 1</td>
</tr>
<tr>
<td>Difficulty in walking</td>
<td>14</td>
</tr>
<tr>
<td>Inability to walk</td>
<td>22</td>
</tr>
<tr>
<td>Total loss of muscle power in L.limb</td>
<td>13</td>
</tr>
<tr>
<td>Bladder involvement</td>
<td>8</td>
</tr>
<tr>
<td>Sensory loss</td>
<td>4</td>
</tr>
<tr>
<td>Pain</td>
<td>2</td>
</tr>
<tr>
<td>Kyphosis</td>
<td>2</td>
</tr>
</tbody>
</table>
with loss of motor power, bladder involvement, pain, loss of sensation below abdomen and kyphotic prominence in the back.

5.22.2 **Difficulty in walking**: The first symptom noticed by the patients was difficulty or clumsiness while walking. This difficulty lasted for one to 3 months before they became totally bed ridden. The minimum duration of disability reported was 21 days and maximum was 270 days. Less than one month duration of inability to walk was complained by 22. The remaining 11 patients sought hospital admission after 2 or more months of inability to walk. **Loss of Muscle power**: Total loss of muscle power was complained by 16 patients of whom 13 came to hospital within one month.

5.22.3 **Sensory blunting**: Twenty one (64%) patients complained of sensory blunting; of which 4 had for a period less than a month, 9 patients for one to 2 months, 6 patients between 2 to 3 months and two patients for more than three months.

5.22.4 **Difficulty in Micturition**: This problem presented as hesitancy to begin with in 14 cases and progressed to retention requiring catheterisation subsequently in 12 patients.

5.22.5 **Sensory loss**: Twenty one (64%) patients complained of sensory loss; of this 4 had for less
than one month, 9 for one to 2 months, 6 for 2 to 3 months and 2 for more than 3 months.

5.22.6 Pain: This was the presenting symptom in 25 patients; of these 2 had pain for less than one month, 7 for one to 2 months, 9 for 2 to 3 months and 7 for more than 3 months.

5.22.7 Kyphosis: Kyphosis was observed in 16 patients; the duration of kyphosis was for less than 1 month in 2, for 1 to 2 months in 2, for less than 3 months in 8 and in the 16 remaining for more than 3 months in the remaining 16.

5.23 SIGNS ON ADMISSION

The presence of bed sores, kyphosis and paraspinal muscle spasm, temperature and blood pressure were recorded. Under neurological examination motor power, muscle tone, Deep tendon reflexes (DTR), sensory blunting, bladder involvement, plantar reflex and presence of clonus were looked for.

Six patients had fever, 3 had bed sores less than 2 cm in diameter and 3 had discharging sinus. There were no obvious cold abscess. Kyphosis was seen in 16 patients. Tenderness over spine and paraspinal spasms were seen in all the cases.

5.23.1 Neurological examination: Higher function, cranial nerves and upper limbs were normal in all the patients. Motor system examination of the lower
limb revealed the following. Lower limb muscle power was MRC grade '0' in almost all the groups of muscles in 18 patients, grade 1 to 2 in 4, grade 3 in 10 and grade 4 in one. Muscle tone was spastic in all the patients except for two in whom the tone was diminished. Examination of DTR revealed the knee jerks to be exaggerated in 26, diminished in 4 and absent in 3. Ankle jerk was exaggerated in 25, absent in 4, diminished in 3 and normal in the rest. Plantar reflex was extensor in 28 and absent in 5. Patellar clonus was elicited in 4 and ankle clonus in 16.

5.24 BACTERIOLOGY
The operated specimens and pus collected at the time of surgery were sent for smear and culture examination. AFB was observed in 11 by smear examination and 13 (54%) cases by culture. Sensitivity tests were carried out in 12; All the 12 strains were sensitive to streptomycin, one culture had strains resistant to INH alone and in one both to INH and rifampicin.

5.25 HISTOPATHOLOGY
All the features of tuberculous histopathology such as caseation, necrosis, epithelioid cells and giant cells were present in 17 and in the remaining 7, caseation was conspicuously absent.
5.26 TREATMENT

Patients admitted to the study belonged to one of the following 4 main treatment groups. Chemotherapy was given for 9 months to all 33 patients.

a) Chemotherapy + Modified Hong Kong Surgery : (RAD) 15 patients (Plate-9a & 9b).

b) Chemotherapy + Costotransversectomy Surgery (CS) : 5 patients.

c) Chemotherapy alone (CHEM) : 9 patients

d) Chemotherapy + Hong Kong Surgery after two months of chemotherapy (Patients who did not improve in group C) : (CHEM-RAD) 4 patients.

5.26.1 Number of patients in the analysis: Of 33 patients admitted to the study, 4 died during treatment phase and 29 patients were available for the analysis.

5.26.2 Chemotherapy received: All the patients were received more than 80% of the prescribed chemotherapy, 18 of 29 patients had 100%. 8 patients had 95 to 100% and 3 had 80 to 90% of chemotherapy.

5.26.3 Drug supply: In the Initial 3 months and during the period of hospitalisation chemotherapy was given under supervision to all patients and subsequently drugs were supplied once a week.

5.26.4 Surgery: 24 patients underwent surgery and Table 5.2.3 describes the findings observed during surgery. At surgery 63% of patients had
### TABLE 5.2.3 Observations during surgery in 24 operated Pott's Paraplegia cases

<table>
<thead>
<tr>
<th>Observations*</th>
<th>No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vertebral involvement</td>
<td>20</td>
<td>83</td>
</tr>
<tr>
<td>Disc Involvement</td>
<td>17</td>
<td>69</td>
</tr>
<tr>
<td>Granulation tissue</td>
<td>15</td>
<td>63</td>
</tr>
<tr>
<td>Cold abscess</td>
<td>11</td>
<td>45</td>
</tr>
<tr>
<td>Pleural adhesion</td>
<td>9</td>
<td>38</td>
</tr>
<tr>
<td>Aspiration of Pus</td>
<td>8</td>
<td>33</td>
</tr>
<tr>
<td>Caseous material</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>Sequestrum</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>Lung tubercle</td>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>Internal gibbus</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>

*a few pts. had more than one finding*
granulation tissue. Only 2 patients showed penetration of dura.

Cold abscess was seen in 11 (45%) and pulmonary tubercle in 3 (12%).

5.27 ADVERSE REACTIONS TO CHEMOTHERAPY
Thirty one cases were analysed for adverse reactions excluding 2 deaths. Adverse reactions including both major and minor were observed in 6 (19%) of 33 patients. Major reactions necessitating drug interruption or termination was observed in 4 (13%). Jaundice occurred in 4 (13%) of 31 patients and the time of onset was the 7th day, 9th day, 30th day and 60th day respectively after surgery. Rifampicin was terminated and treatment was changed to streptomycin and isoniazid twice a week or ethambutol and isoniazid daily. Two patients developed peripheral neuropathy in the second month of treatment, which subsided gradually after 8 weeks of administration of pyridoxine.

5.28 MORTALITY
Of the total 33 patients admitted to the study, 4 died during treatment phase and two died during follow up phase. The deaths were due to post-operative complications in two (on 8th day and 16th day of surgery), aspiration and respiratory distress in one (34th day), myocardial infarction in 2 (11th month,
46th day) and bladder calculus and renal failure in one (15th month).

5.29 NEUROLOGICAL RECOVERY PATTERN

The neurological recovery is described under the following headings.

a) The time taken for recovery of motor functions, muscle tone, bladder, sensory system, DTR, ankle and patellar clonus.

b) The time taken for the patient to become ambulant and

c) the duration of hospitalisation needed.

5.29.1 Motor Power Recovery: A total of 29 patients were available for this analysis and table 5.2.4 gives the details of motor recovery among patients belonging to various treatment groups. Overall, among 29 patients, complete motor recovery (motor power MRC grade 4 or 5) in all groups of muscles occurred by 1 month in 5 patients, by 2 months in 12, by 3 months in 18, by 4 months in 22, by 5 months in 25, by 6 months in 26 and more than 7 months in 29. It is interesting to observe that 62% had complete motor recovery by 3 months and 90% by 6 months.

Of 5 patients who had costotransversectomy (CS group), 2 recovered within 2 months and all the 5 recovered by 3 months. Among the 13 patients
### TABLE-5.2.4 Distribution of patients according to Motor Recovery and Treatment Groups

<table>
<thead>
<tr>
<th>Motor recovery in months</th>
<th>Treatment groups</th>
<th>Total</th>
<th>Cumulative total %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chem</td>
<td>CHEM-RAD</td>
<td>CS</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>--</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>--</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>1</td>
<td>--</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>6</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>≥ 7</td>
<td>--</td>
<td>2</td>
<td>--</td>
</tr>
<tr>
<td>Treatment group</td>
<td>No. of cases</td>
<td>Motor power recovery</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td>-------------</td>
<td>----------------------</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Range in days</td>
<td>Mean days</td>
</tr>
<tr>
<td>CHEM</td>
<td>8</td>
<td>28 - 150</td>
<td>52</td>
</tr>
<tr>
<td>CHEM-RAD</td>
<td>3</td>
<td>91 - 240</td>
<td>190</td>
</tr>
<tr>
<td>CS</td>
<td>5</td>
<td>49 - 70</td>
<td>59</td>
</tr>
<tr>
<td>RAD</td>
<td>13</td>
<td>13 - 450</td>
<td>102</td>
</tr>
<tr>
<td>ALL</td>
<td>29</td>
<td>13 - 450</td>
<td></td>
</tr>
</tbody>
</table>
admitted to the RAD regimen, 4 recovered by the first month, three by 2nd month and 2 by 3rd month. Thus 9 of 13 showed complete recovery in motor power by the 3rd month. The remaining four showed recovery in 4th, 5th and 6th and 15th month respectively. In CHEM group all the 8 recovered by 5 months. In CHEM-RAD group one recovered by 4th month - other two took more than 7 months. Table 5.2.5 describes the mean days and median days of muscle motor power recovery in the 4 treatment groups. The median varied from 60-165 days. It is obvious from Table 5.2.6 that the motor power muscle recovery in patients with initial power 0 or 1 was 38 to 450 days when compared to patients with initial muscle power grade 2-4 where recovery ranged from 13 to 120 days.

5.29.2 Muscle tone recovery: The spasticity found initially in the lower limbs returned to normal tone with treatment. The recovery of tone took a longer time compared to muscle power recovery. Of the 29 patients in the analysis, tone was normal by 2nd month in 8 patients by 3rd month in 11 patients and by 6 months in 21 patients. In the remaining 8 patients tone recovery took more than 7 months. (From 210 days to 1440). Motor recovery also was delayed in these cases but comparatively motor
<table>
<thead>
<tr>
<th>Treatment group</th>
<th>Initial motor power grade</th>
<th>No. of patients</th>
<th>Mean days for complete motor recovery</th>
<th>Range (days)</th>
<th>Median (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM</td>
<td>0-1</td>
<td>5</td>
<td>117</td>
<td>75 - 150</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>2-4</td>
<td>3</td>
<td>47</td>
<td>28 - 56</td>
<td>56</td>
</tr>
<tr>
<td>CHEM-RAD</td>
<td>0-1</td>
<td>3</td>
<td>190</td>
<td>91 - 240</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>2-4</td>
<td>0</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>CS</td>
<td>0-1</td>
<td>3</td>
<td>59</td>
<td>49 - 63</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>2-4</td>
<td>2</td>
<td>60</td>
<td>49 - 70</td>
<td></td>
</tr>
<tr>
<td>RAD</td>
<td>0-1</td>
<td>6</td>
<td>162</td>
<td>38 - 450</td>
<td>150</td>
</tr>
<tr>
<td></td>
<td>2-4</td>
<td>7</td>
<td>51</td>
<td>13 - 120</td>
<td>42</td>
</tr>
<tr>
<td>ALL</td>
<td>0-1</td>
<td>17</td>
<td>-</td>
<td>38 - 450</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>2-4</td>
<td>12</td>
<td>-</td>
<td>13 - 120</td>
<td>-</td>
</tr>
</tbody>
</table>
recovery was more rapid than tone recovery. It is also observed that initial muscle power was '0' among 7 of these 8 cases who had delayed tone recovery.

The treatment received by 8 patients who had a delay in muscle power and tone recovery is shown in Table-5.2.7. These 8 patients were equally distributed in all the 4 treatment groups. Thus tone recovery was not influenced by the type of management surgical or medical.

5.29.3 Bladder function: Of the 29 patients available for analysis, 10 had bladder involvement initially. The recovery of bladder function was within one month in 7 cases, within 2 months in 8, within 4 months in 9. In one patient the recovery took a long time i.e. 180 days. This patient belonged to CHEM-RAD regimen.

5.29.4 Clonus

a) Patellar clonus: Of 33 patients examined initially, patellar clonus was elicited in 5. With treatment, this sign disappeared in these 5 cases, after 20, 56, 56, 63 and 180 days. Though in 4 cases patellar clonus disappeared by 2nd month. Nevertheless, it persisted up to 6 months in one case.

b) Ankle clonus: Fifteen of 33 had initial ankle clonus. Ankle clonus disappeared in 3 by one month, in 4 by 2 months, in 2 by 4 months, in 3 by 6 months and in another 3 by 8 months (Range 6 days - 240 days).

There was no correlation between patients who had delayed tone recovery and patients with
<table>
<thead>
<tr>
<th>Initial Muscle power</th>
<th>Muscle power recovery (days)</th>
<th>Tone recovery (days)</th>
<th>Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>120</td>
<td>210</td>
<td>CHEM</td>
</tr>
<tr>
<td>3</td>
<td>70</td>
<td>210</td>
<td>CS</td>
</tr>
<tr>
<td>0</td>
<td>91</td>
<td>330</td>
<td>CHEM-RAD</td>
</tr>
<tr>
<td>0</td>
<td>240</td>
<td>450</td>
<td>CHEM-RAD</td>
</tr>
<tr>
<td>0</td>
<td>180</td>
<td>540</td>
<td>RAD</td>
</tr>
<tr>
<td>0</td>
<td>450</td>
<td>720</td>
<td>RAD</td>
</tr>
<tr>
<td>0</td>
<td>150</td>
<td>720</td>
<td>CHEM</td>
</tr>
<tr>
<td>0</td>
<td>240</td>
<td>1440</td>
<td>CHEM-RAD</td>
</tr>
</tbody>
</table>
persistent ankle clonus. Similarly the recovery pattern of muscle tone and ankle clonus recovery had no correlation.

5.29.5 **Deep Tendon jerks:**

a) **Knee jerk:** Twenty eight of 33 patients had exaggerated knee jerks. The knee jerk became normal within 3 months in 5 patients, within 6 months in 15, by 9 months in 7 cases, by one year in 19 cases. Knee jerks continued to remain brisk up to 3rd and 4th year in the remaining cases (Range 10-1440 days).

b) **Ankle jerk:** 25 cases had exaggerated ankle jerks at the initial examination. This reflex became normal by 3 months in 4, by 6 months in 11, by 9 months in 15 and by one year in 17. In the remaining 8 cases recovery took 3 to 4 years. The minimum period of recovery was 28 days and maximum 1440 days.

c) **Plantar reflex:** Extensor plantar reflex was observed in 29 of 33 cases. This response became flexor by one month in 3, by 3 months in 6, by 6 months in 16, by 9 months in 20, and by 12 months in 21 cases. In the remaining cases it took as long as 1440 days to revert to flexor response (Range 21 days to 1440 days).

5.29.6 **Sensory Recovery:** Sensory blunting was present in 23 of 33 patients at the initial examination. Excluding 2 deaths from these 23, the time for recovery varied in the remaining 21 (minimum of 13 days to a maximum of 270 days). 4 patients showed recovery within one month, 7 by 2nd month 13 by 3rd month, 18 by 6th month, all the 21 by one year. (Table-5.23).

5.30 **TIME TAKEN TO BECOME AMBULANT**

This denotes the number of days taken for the patient to walk on his own with or without support. Since
<table>
<thead>
<tr>
<th>Treatment group</th>
<th>Total No.</th>
<th>No. with sensory involvement</th>
<th>Time taken for recovery</th>
<th>Mean (days)</th>
<th>Range (days)</th>
<th>Median (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM</td>
<td>8</td>
<td>7</td>
<td></td>
<td>84</td>
<td>21-150</td>
<td>63</td>
</tr>
<tr>
<td>CHEM-RAD</td>
<td>3</td>
<td>3</td>
<td></td>
<td>210</td>
<td>91-240</td>
<td>210</td>
</tr>
<tr>
<td>CS</td>
<td>5</td>
<td>3</td>
<td></td>
<td>32</td>
<td>18-42</td>
<td>35</td>
</tr>
<tr>
<td>RAD</td>
<td>13</td>
<td>8</td>
<td></td>
<td>95</td>
<td>13-270</td>
<td>67</td>
</tr>
<tr>
<td>ALL</td>
<td>29</td>
<td>21</td>
<td></td>
<td></td>
<td>13-270</td>
<td>-</td>
</tr>
</tbody>
</table>
admission of 29 patients, the mean time taken to become ambulant was 132 days in CHEM group, 284 days in CHEM-RAD group, 154 in Costotransversectomy (CS group) and 185 days in RAD. (Table-5.2.9).

5.31 PERIOD OF HOSPITALISATION

Patients were hospitalised initially until they showed enough recovery to walk or stand with support. The period of hospitalisation in different treatment groups were as follows: Chemotherapy alone (CHEM) group 89 days (range 47-153) chemotherapy followed by surgery group (CHEM-RAD) 264 days (range 151-367 days), costotransversectomy (CS) group 95 days (range 43-155 days) and in radical surgery (RAD) group 90 days (range 38-122 days) (Table-5.2.10).

The mean days of hospitalisation required for all 29 patients was 135 days.(Median days 111).

5.32 FACTORS WHICH CAN INFLUENCE RECOVERY

The motor recovery was influenced by (a) initial motor power (b) bladder involvement and (c) sensory blunting.

a) Initial muscle power: Patients with initial muscle power grade '0' or '1' had a delayed recovery (154 days) compared with the group who had initial grade of 2 or 3 (47 days).

b) Initial Bladder involvement: The motor recovery among patients with bladder involvement was 171 days (10 patients) compared to 67 days among those without bladder involvement (19 patients).

c) Initial Sensory blunting: The mean days of motor recovery among patients with sensory involvement was 108 days (21 patients) compared to 80 days (8 patients) without sensory involvement.
<table>
<thead>
<tr>
<th>Treatment group</th>
<th>No. of cases</th>
<th>Range in (days)</th>
<th>Mean (days)</th>
<th>Median (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM</td>
<td>8</td>
<td>68 - 212</td>
<td>132</td>
<td>130</td>
</tr>
<tr>
<td>CHEM-RAD</td>
<td>3</td>
<td>277 - 296</td>
<td>284</td>
<td>278</td>
</tr>
<tr>
<td>CS</td>
<td>5</td>
<td>94 - 234</td>
<td>154</td>
<td>129</td>
</tr>
<tr>
<td>RAD</td>
<td>13</td>
<td>62 - 322</td>
<td>185</td>
<td>167</td>
</tr>
</tbody>
</table>
### TABLE-5.2.10 Duration of hospitalisation

<table>
<thead>
<tr>
<th>Treatment group</th>
<th>No. of cases</th>
<th>Range in days</th>
<th>Mean (days)</th>
<th>Median (days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM</td>
<td>8</td>
<td>47 - 153</td>
<td>89</td>
<td>70</td>
</tr>
<tr>
<td>CHEM-RAD</td>
<td>3</td>
<td>151 - 367</td>
<td>244</td>
<td>213</td>
</tr>
<tr>
<td>CS</td>
<td>5</td>
<td>43 - 155</td>
<td>95</td>
<td>98</td>
</tr>
<tr>
<td>RAD</td>
<td>13</td>
<td>38 - 122</td>
<td>91</td>
<td>87</td>
</tr>
<tr>
<td>ALL</td>
<td>29</td>
<td>38 - 367</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
5.33 TIME TAKEN FOR RECOVERY OF VARIOUS SIGNS

The time (days) taken for various neurological signs present at the time of admission to return to normal is described in Table 5.2.11. The mean days of recovery varied from 24 to 405 days for different neurological signs.

5.34 SUMMARY OF RECOVERY

Table 5.2.12 describes the order of recovery observed with regard to different neurological signs.

5.35 HEALING OF SINUSES

3 patients had sinuses and in all the three healing took place between 2nd and 3rd month.

5.36 LONG TERM FOLLOW-UP

Twenty-seven patients were available for 5 year follow-up. At 5th year, all the 27 patients had normal neurological examination. There were no relapses. These 27 patients had gone back to their original occupation.

5.37 NEUROLOGICAL STATUS AT THE TIME OF DEATH

Three deaths were reported; 2 following surgery and one due to aspiration. The remaining three patients recovered from paraplegia, completely in two and one partial before death.

5.38 PROGNOSTIC FACTORS AND SCORING SYSTEM

In this study, an attempt was made to evolve a scoring system which can offer guidelines in predicting the
<table>
<thead>
<tr>
<th>Neurological signs</th>
<th>No. of pts.</th>
<th>Time for recovery (in days)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Minimum</td>
</tr>
<tr>
<td>Muscle motor power reduced</td>
<td>29</td>
<td>13</td>
</tr>
<tr>
<td>Muscle tone spasticity</td>
<td>27</td>
<td></td>
</tr>
<tr>
<td>Sensory blunting</td>
<td>21</td>
<td>13</td>
</tr>
<tr>
<td>Bladder involvement</td>
<td>11</td>
<td>7</td>
</tr>
<tr>
<td>Ankle jerk exaggerated</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>Knee jerk exaggerated</td>
<td>26</td>
<td>10</td>
</tr>
<tr>
<td>Patellar clonus</td>
<td>5</td>
<td>28</td>
</tr>
<tr>
<td>Ankle clonus</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Plantar extensor</td>
<td>28</td>
<td>21</td>
</tr>
</tbody>
</table>
### Table 5.2.12: Recovery of Neurological Signs

<table>
<thead>
<tr>
<th>Time taken for recovery in months</th>
<th>Neurological signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 3 mths</td>
<td>Bladder</td>
</tr>
<tr>
<td></td>
<td>Patellar clonus</td>
</tr>
<tr>
<td>4 - 6 mths</td>
<td>Muscle motor power</td>
</tr>
<tr>
<td></td>
<td>Sensory blunting</td>
</tr>
<tr>
<td></td>
<td>Ankle clonus</td>
</tr>
<tr>
<td>More than 7 mths</td>
<td>Muscle tone</td>
</tr>
<tr>
<td></td>
<td>Knee jerk</td>
</tr>
<tr>
<td></td>
<td>Ankle jerk</td>
</tr>
<tr>
<td></td>
<td>Plantar reflex</td>
</tr>
</tbody>
</table>
recovery. This scoring system was based on the factors identified by Seddon (1935) for neurological recovery but with suitable modifications.

5.38.1 Prognostic factors used in this study:
Eight factors have been identified; six pretreatment and two during treatment. All factors were given equal weightage. Each factor was given a score of 1 if present and 0 if absent. The maximum possible score was 8 and the minimum was 0. The recovery pattern was compared with the scores.

Pretreatment Factors:

a) Muscle motor power MRC grade '0' or 1
b) Bladder involvement necessitating catheterisation
c) Sensory blunting below umbilicus (D10 and below)
d) Inability to walk for more than one month (31 days and above) before treatment.
e) Age above 50 years.
f) Presence of kyphosis for more than 6 months.

Factor while on treatment at 1st month:

g) Absence of muscle power recovery at least by 2 grades compared to initial score. e.g. if initial score was '0' at 1st month and recovery was grade 2 or more.
h) Persistence of bed sores.

5.38.2 The motor recovery in days vs the score obtained based on the above factors: With score 0 to 2 the motor recovery was 48 days (RAD), 63 days
(CHEM), 59 days (CS). There were no patients with score 0 to 2 in CHEM-RAD regimen. The mean recovery in days of all the patients and of all the treatment groups for score less than 2 was 57 days (Table 5.2 - 13).

When the scores were 3-4, the mean days of recovery was 107 days (RAD) and 98 days (CHEM) and the mean for all patients admitted with this scores was 102 days.

With higher scores the mean days for recovery increased both in RAD series and CHEM series.

With scores above 5, the mean days for recovery was 315 days in RAD series and 190 days in CHEM-RAD series. The overall mean for a score of 5 and above was 253 days.

The multiple linear regression analysis on ambulant days showed that of the 8 variables only three, namely bed sores, initial motor power and duration of kyphosis, had a significant effect on the mean ambulant days. The corresponding regression co-efficients (with 95% confidence limits) are respectively 64 days (3-126 days), 97 days (23-171 days) and 158 days (101-215 days). Based on the three factors identified, a modified scoring system was evolved, whereby the patient gets a maximum score of 3 and a minimum of 0.
### TABLE-5.2.13 Motor Recovery in days according to clinical 'scores' based on prognostic factors

<table>
<thead>
<tr>
<th>Regimen &amp; (No. Pts.)</th>
<th>Mean days of Motor recovery</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Score 0-2</td>
<td>Score 3-4</td>
<td>Score &gt; 5</td>
<td></td>
</tr>
<tr>
<td>RAD (13)</td>
<td>48</td>
<td>107</td>
<td>315</td>
<td></td>
</tr>
<tr>
<td>CHEM (8)</td>
<td>63</td>
<td>98</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>CS (5)</td>
<td>59</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>CHEM-RAD (3)</td>
<td>--</td>
<td>--</td>
<td>190</td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>57</td>
<td>102</td>
<td>253</td>
<td></td>
</tr>
<tr>
<td>REGIMEN</td>
<td>PATIENTS NO.</td>
<td>DAYS IN RECOVERY</td>
<td>MODIFIED SCORE</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>--------------</td>
<td>------------------</td>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>CHEM</td>
<td>8</td>
<td>32</td>
<td>73</td>
<td>-</td>
</tr>
<tr>
<td>CHEM-RAD</td>
<td>3</td>
<td>-</td>
<td>-</td>
<td>190</td>
</tr>
<tr>
<td>CS</td>
<td>5</td>
<td>60</td>
<td>56</td>
<td>0</td>
</tr>
<tr>
<td>RAD</td>
<td>13</td>
<td>52</td>
<td>86</td>
<td>315</td>
</tr>
</tbody>
</table>
5.38.3. **Motor recovery based on "Modified Scoring"**: 

The correlation of motor recovery to these three major factors was analysed and the motor recovery in the four treatment regimens was as follows. Recovery was within two months in patients with score '0' (CHEM: 32 days, CS: 60 days, RAD: 52 days); and 2-3 months with score 1 (CHEM: 73 days, CS: 56 days, RAD: 86 days). In patients with 2 scores the recovery was more than 6 months (CHEM-RAD: 190 days, RAD: 315 days).

5.39. **ROLE OF SURGERY**

With the above finding with scores of less than 4, surgery had not conferred additional benefit (Table 5.2.13) and there is an equal chance of recovery without surgery. However, this is based on small population and findings need to be confirmed with larger numbers.