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Computed Tomography (CT) Guided Stereotactic Aspiration of Brain Abscesses With Leksell Stereotactic Frame

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SUMMARY

Nine patients with small, deep or multiple brain abscesses underwent computed tomography guided stereotactic aspiration using Leksell stereotactic frame. Abscess resolution was confirmed in all patients with clinical and radiological evaluation. Two patients required additional aspiration after initial procedure. Microbiological identification of infectious agent was possible in 6 (66%) cases. Initially broad spectrum antibiotic therapy was begun which was adjusted after final results of culture and sensitivity studies were available. Antibiotic therapy lasting 4-8 weeks was used. One patient had clinical deterioration with increased hemiparesis. There was no mortality. Stereotactic aspiration is a safe and effective technique to diagnose and treat small or deep seated abscesses. Empirical therapy of suspected brain abscesses is rarely warranted in the era of computed tomography guided stereotactic surgery.

INTRODUCTION

Neurosurgeons have debated the value of either drainage or excision in the management of brain abscesses. Lars Leksell described the use of stereotactic technique to diagnose and treat brain abscesses.

Stereotaxy not only minimized trauma to the brain but also enabled more precise diagnosis and more accurate localization of the aspiration site[1].

True potential of stereotaxy in neurosurgery was unlocked with the advent of computed tomography (CT). Excellent results in the treatment of abscesses with CT directed stereotaxy were reported[2,3].

Since the introduction of this technique, overall mortality has decreased in patients with intracranial infections[4,5]. During the past decade the mortality rate for treatment of cerebral abscesses has decreased 0-8% as compared to 70-80% in pre CT era[6]. This process has been attributed to earlier clinical and radiological diagnosis, improved microbiological and surgical techniques, availability of more potent antibiotics and earlier surgery[7].

In this article we review our experience to demonstrate the role of stereotactic surgery in the management of intracranial infections.

MATERIAL AND METHODS

Between November 1994 and February 1996, 9 patients (6 men and 3 women), aged 22-63 years underwent stereotactic diagnosis and treatment of cerebral abscesses. In all patients we performed burr hole aspiration as single or repeat procedure. Table 1 summarizes the clinical presentation.

Table 1: Symptoms and signs in 9 patients with intracerebral abscesses.

	No. of Patients
Symptoms	
Headache	6
Fever	5
Nausea and/or vomiting	2
Seizure	2
Neurological Signs	
Meningismus	4
Altered sensorium	1
Focal deficit	3

High resolution CT scans were obtained preoperatively in all patients. Stereotactic technique was chosen for small, deep or multiple abscesses. Eight had solitary and 1 had multiple lesions (Table 2). Contrast enhanced images in all 9 patients showed peripheral enhancing lesions with reduced attenuation centers.

Table 2: Intraoperative computed tomographic findings of intracerebral abscess (n = 29)

	No. of Patients
Appearance	
Solitary lesion	8
Multiple lesion	1
Ring enhancing	8
Location	
Supratentorial	7
Infratentorial	2

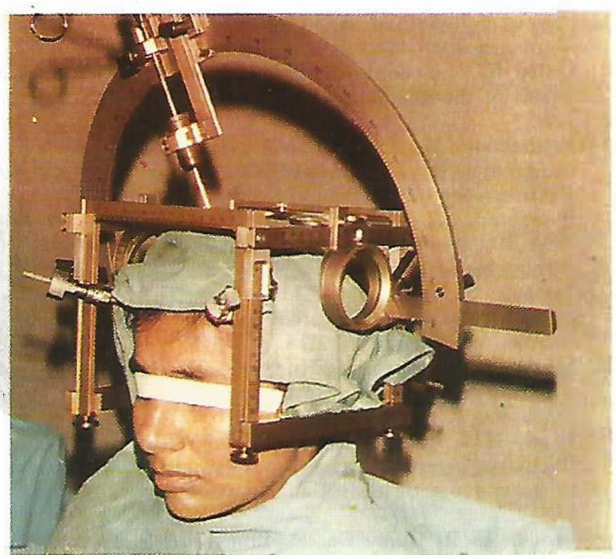

Fig. 1: CT calculated coordinates X, Y, Z are adjusted on Leksell stereotactic frame.

The Leksell stereotactic system (Elekta instruments) was used in all procedures. After the coordinate frame was attached to the patients head under local anaesthesia, I/V contrast enhanced CT imaging was performed. The stereotactic coordinates of the target were identified and probe trajectories were chosen to minimize brain injury in order to reach the targets (Fig. 1). For supratentorial abscesses, ventricles, cisterns and critical areas of brain function were avoided. For infratentorial abscesses transcerebellar route was chosen[8,9].

RESULTS

For all lesions, gentle aspiration was performed using 2.5mm aspiration probe placed at the center of ring enhancing lesion. The abscess was allowed first to drain spontaneously after which slow and gentle aspiration was performed (Figs. 2 and 3).

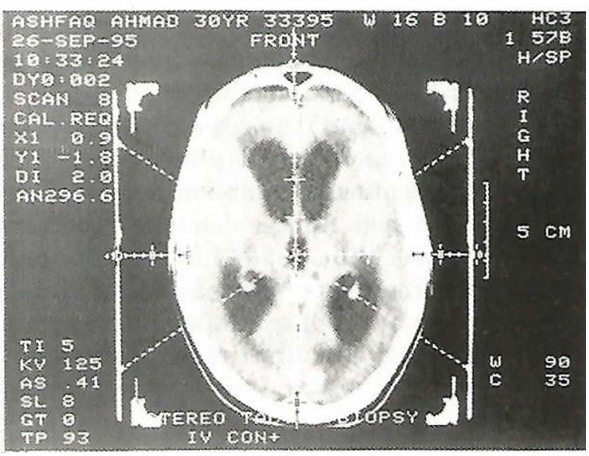

Fig. 2: Preoperative axial CT scan showing deep seated midline abscess with target localization.

Fig. 3: Postoperative axial CT scan of same patient as in figure 2, 24 hours after stereotactic aspiration showing complete obliteration of abscess cavity.

Aspirates of purulent material were obtained for culture, immediate Gram stain and pathological examination. Initially broad - spectrum antibiotic therapy was started. After final results of culture and sensitivity studies were available, the antibiotic regimen was adjusted appropriately.

Of 9 patients who had single stereotactic aspirations, microbiological identification of infectious agents was possible in 6 (66%) (3 pseudomonas, 2 klebsiella, 1 streptococcus), the remainder 3 (34%) had a negative culture but nonetheless responded to long term broad spectrum antibiotic therapy consisting of triple regimen (Co-trimoxazole, Choloramphenicol, Benzyl penicillin) lasting 4 to 8 weeks depending upon clinical and radiological evaluation of resolution of abscess.

Two (22%) patients required a single additional second aspiration after initial procedure and had eventual complete abscess resolution.

One patient had clinical deterioration shortly after simple stereotactic aspiration with increased hemiparesis. Progressive edema and probable venous infarction were felt to be etiologic events.

No patient died as a direct result of stereotactic surgical procedures.

DISCUSSION

Stereotactic technique under local anaesthesia eliminates the potential risk of explorative craniotomy. It also decreases the risks of inaccurate localization and need for multiple probe passes through the brain as associated with free hand biopsy and also allows preselection of trajectory that reduces the risk of seeding the cerebrospinal fluid cavities.

Although empiric antibiotic therapy for suspected brain infections has been advocated[10,11] but appropriate antibiotic therapy requires accurate bacteriological and histological confirmation of the infectious agents. Gentle aspiration of pus increases the efficacy of future antibiotic therapy and is essential treatment for intracerebral abscesses[12,13].

The combination of stereotactic surgery and modern neurodiagnostic imaging facilitates earlier recognition, intraoperative target selection and post operative recognition of complications and more effective antibiotics has contributed to a very low mortality and morbidity in the treatment of brain abscesses[14,15,16].

In conclusion stereotaxy has proved to be a safe, accurate and effective approach for treating patients with intracerebral abscesses and in many cases should be the treatment of choice.

REFERENCES

1. Apuzzuo MLJ, Sabshin JK. Computed tomographic guidance stereotaxis in the management of intracranial mass lesions. Neurosurgery 1983; 12: 277-85.
2. Apuzzo MLJ, Chandrasoma PT, Cohen D et al. Computed imaging stereotaxy: Experience and perspective related to 500 procedures applied to brain masses. Neurosurgery 1987; 20: 930-37.
3. Gleason CA, Wise BL, Feinstein B. Stereotactic localization (with computerized tomographic scanning), biopsy and radiofrequency treatment of deep brain lesions. Neurosurgery 1978; 2: 217-22.
4. Broggi G, Franzini A, Peluchetti D, Servello D. Treatment of deep brain abscesses by stereotactic implantation of an intracavitary device for evacuation and local application of antibiotics. Acta Neurochir 1985; 76: 94-8.
5. Lunsford LD, Nelson PB. Stereotactic aspiration of a brain abscess using the "therapeutic" CT scanner. A case report. Acta Neurochir 1982; 62: 25-9.
6. Rousseaux M, Lesoin F, Destee A, Jomin M, Petit H. Developments in the treatment and prognosis of multiple cerebral abscesses. Neurosurgery 1985; 16: 304-8.
7. Dyste GN, Hitchon PW, Menezes AH et al. Stereotaxic surgery in the treatment of multiple brain abscesses. J Neurosurg 1988; 69: 188-94.
8. Coffey RJ, Lunsford LD. Stereotactic surgery for mass lesions of the midbrain and pons. Neurosurgery 1985; 17: 12-8.
9. Rajshekhar V, Chandy MJ. Successful stereotactic management of a large cardiogenic brain stem abscess. Neurosurgery 1994; 34: 368-71.
10. Rosenblum ML, Hoff JT, Norman D, Edwards MS and Berg BO. Non-operative treatment of brain abscesses in selected high risk patients. J Neurosurg 1980; 52: 217-25.
11. Vaquero J, Cabezudo JM, Leunda G. Non surgical resolution of a brain stem abscess: case report. J Neurosurg 1980; 53: 726-27.
12. Gortvai P, De louvois J, Hurley R. The bacteriology and chemotherapy of acute pyogenic brain abscess. Br J Neurosurg 1987; 1: 189-203.
13. Nauta HJW, Contreras FL, Weiner RL, Crofford MJ Brainstem abscess managed with computed tomography - guided stereotactic aspiration. Neurosurgery 1987; 20: 476-80.
14. Kondziolka D, Duma Ch. M, Lunsford LD. Factors that enhance the likelihood of successful stereotactic treatment of brain abscesses. Acta Neurochir 1994; 127: 85-90.
15. Itakura T, Yokote H, Ozaki F, Itatani K, Hayashi S, Komai N. Stereotactic operation for brain abscess. Surg Neurol 1987; 28: 196-200.
16. Rosenblum ML, Hoff JT, Norman D et al: Decreased mortality from brain abscesses since the advent of computerized tomography. J Neurosurg 1978; 49: 658-68.

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