

UTILITY OF RIGISCAN AND PAPAVERINE IN DIAGNOSIS OF ERECTILE IMPOTENCE

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ABSTRACT—*The Rigiscan machine was used to measure nocturnal penile tumescence and rigidity in 41 men referred for evaluation of erectile impotence. In 6 patients, the Rigiscan was compared with the Tumistore and Snap-Gauge bands. Two patients achieved significant tumescence as measured by Tumistore, and 3 had significant tumescence as indicated by the breaking of two or three of the Snap-Gauge bands. None of these men achieved sufficient rigidity for intercourse as measured by the Rigiscan. Fourteen patients with organic impotence received intracorporeal injections of papaverine and were then monitored by Rigiscan. Six of the 14 were noted to have a Peyronie plaque. Of the remaining 8, 6 of these men achieved lasting erections sufficient for intercourse. The other 2 had erections that lasted ten minutes and were considered to have venous leak impotence. All patients with Peyronie disease had tumescence after papaverine injection, but in 5 the penis became rigid only at the base. Complications of papaverine injection were uncommon and minor. The Rigiscan and papaverine are useful in the diagnosis and management of erectile impotency.*

The achievement of an erection adequate for intercourse requires satisfactory functioning of neural, vascular, hormonal, and psychogenic factors. To identify which of these factors is deficient in an impotent man, several tests are available,¹⁻³ including the intracorporeal injection of papaverine, a nonspecific smooth-muscle relaxant. In normal, neurologically impaired, and psychogenically impotent men, such injection produces a rigid erection within ten minutes, whereas men with vasculogenic impotence have only a partial response.⁴ Increasingly, papaverine is being used therapeutically also. To assess the response to papaverine accurately and to determine the appropriate dose if the drug is to be used therapeutically, an

objective measure is needed. Measurement of the intracorporeal pressure has been used for this purpose, but the important factors, namely the extent of tumescence and rigidity, are often assessed only subjectively.

We have been using the Rigiscan* applied to the base and tip of the penis to obtain a record of the adequacy of erection that can be included in the patient's chart. We herein describe our results in the first 41 patients monitored with this instrument and our experience in assessing effects of intracavernosa pharmacologic agents with Rigiscan in 14 of these patients.

Material and Methods

The 41 men referred for evaluation and management of impotence completed an extensive questionnaire covering medical, surgical,

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TABLE I. Comparison of results of 3 tests of erectile function

Test	No. of Patients
Tumistore	
Tumescence	2
No tumescence	4
Snap-Gauge	
Two or three bands broken	3
No bands broken	3
Rigiscan	
Rigidity	0
Tumescence	6

and sexual history, duration of impotence, and psychosocial factors that could contribute to impotency. In interviews, they were asked about predisposing factors to impotency such as signs and symptoms of diabetes, cardiovascular disease, hypertension, and hypercholesterolemia and were questioned about tobacco and alcohol use. The physical examination focused on the genitalia and neurologic function. The serum testosterone concentration and the penile brachial index were measured.

Patients who underwent the study were given a slow injection of papaverine hydrochloride solution (30 mg in 1 mL) with 0.5 mg phentolamine mesylate via a tuberculin syringe, inserted at a ninety-degree angle into the lateral corpus cavernosum at the proximal shaft. Visual assessment was recorded one-half hour after injection as well as after two hours and at the conclusion of the recording session.

Measurements were recorded by Rigiscan and were done over two nights for the nocturnal penile tumescence study and online, in-house over a four-hour period for those using papaverine. Particular attention was given to the change in tumescence and rigidity as well as time, length, and frequency of erections.

Results

Rigiscan studies

Five patients had normal nocturnal erections as assessed by Rigiscan (Fig. 1). One was being treated with antidepressants; the other 4 were referred for counseling.

Six patients were evaluated using all three measurements of erectile adequacy, Rigiscan, Tumistore, and Snap-Gauge bands. Significantly, although some patients appeared to have nocturnal erections with Tumistore or

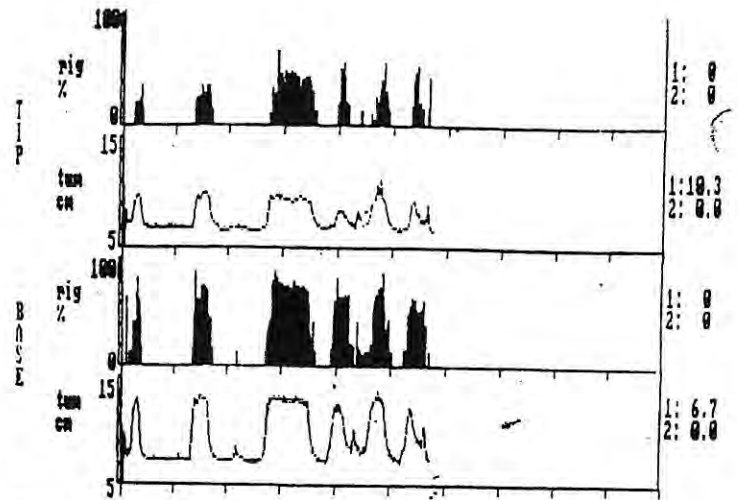


FIGURE 1. Normal nocturnal penile tumescence study with Rigiscan.

Snap-Gauge tests, none had sufficient rigidity to be capable of intercourse according to the Rigiscan instrument (Table I). These patients all had an underlying organic basis for their impotency. All patients had elements of cardiovascular disease, while 2 patients were also diabetics, and 2 patients were heavy cigarette smokers.

Papaverine trial

Diagnostic and/or therapeutic papaverine injection has been done more than 500 times at the institution or at home by the patients. For our study to be objective, some of these were studied with the Rigiscan.

Fourteen patients with organic impotence were given papaverine injections, including 6 patients who were noted to have a Peyronie plaque on physical examination. Among the 8 patients with no significant physical findings, 6 had a moderate to significant increase in tumescence and rigidity that would have been sufficient for sexual penetration. Most of the erections lasted approximately two hours, although 1 patient sustained an erection for longer than four hours (Fig. 2A). The causes of impotence in these 8 patients were 7 patients with cardiovascular disease, 4 of whom also had diabetes, and 2 others who smoked cigarettes excessively. One patient was a former alcohol abuser. The other 2 patients had tumescence and rigidity soon after papaverine injection, but detumescence occurred within ten minutes (Fig. 2B). These patients were considered to have venous leak impotence, where blood quickly shunts out of the corporeal bodies.

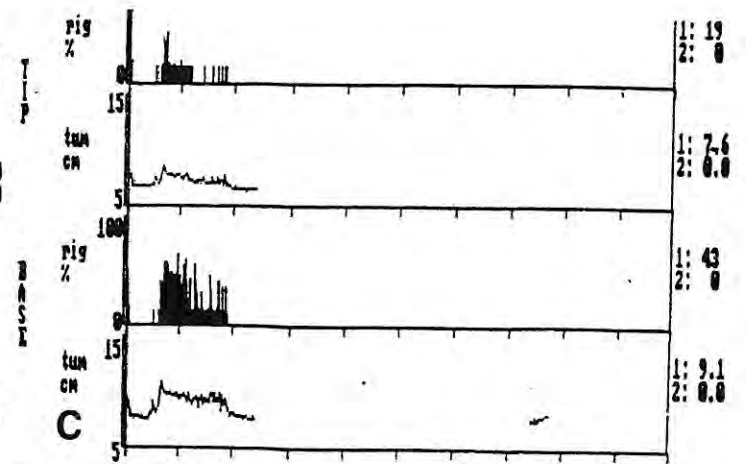
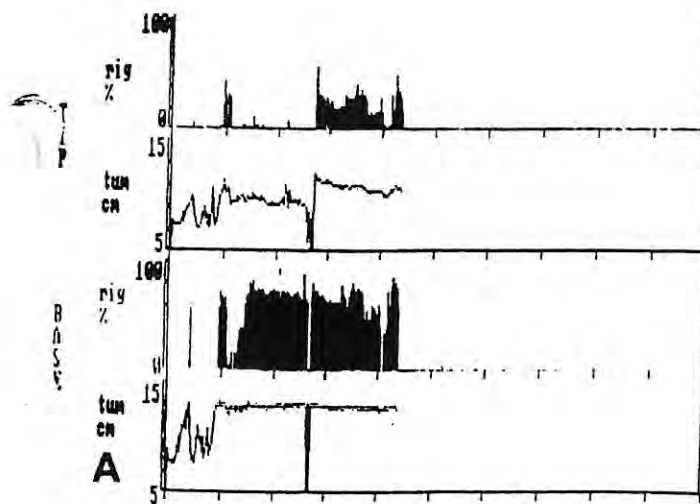
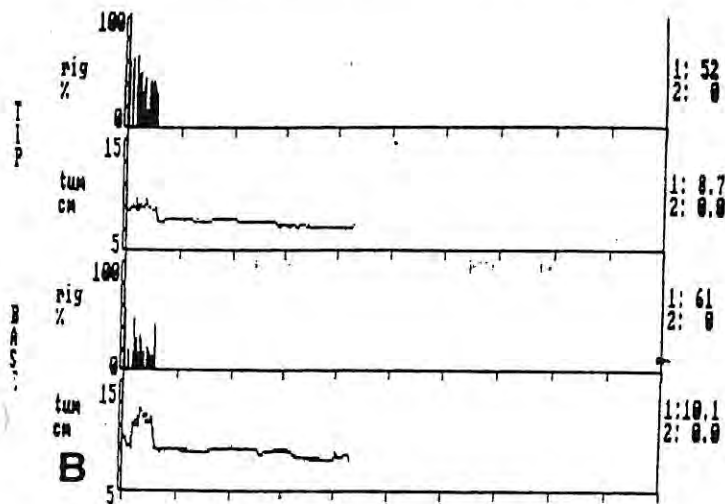


FIGURE 2. Effects of papaverine as monitored by Rigiscan: (A) favorable response, (B) patient with venous leak impotence, and (C) patient with Peyronie disease.



The 6 patients with Peyronie plaques also had papaverine injections. All responded with measurable tumescence, but in 5 cases the penis became rigid only at the base (Fig. 2C).

The only complications of papaverine injection were minor. One patient sustained a hematoma at the injection site after several injections for therapeutic purposes. There were no instances of infection or priapism.

Comment

When investigating the impotent patient, it is essential to study both tumescence and rigidity, since a man with penile tumescence may be unable to achieve or to maintain sufficient rigidity for intercourse.^{5,6} This problem is particularly common in men with vascular insufficiency, who may have considerable tumescence with almost no rigidity (Fig. 3). Circumferential expansion is not always accompanied by penile rigidity. In our study, 10 patients (28%) with adequate tumescence had abnormal or no rigidity. Patients with Peyronie disease demonstrate a dissociation between rigidity at the base and at the tip of the penis,⁷ which distinguishes impotence attributable to this condition from coincidental impotence. The Rigiscan instrument is superior to other available methods of assessing

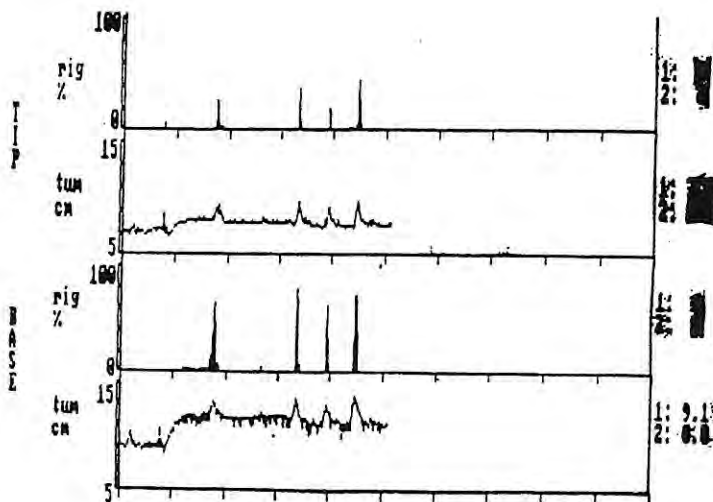


FIGURE 3. Nocturnal penile tumescence study with Rigiscan in patients with vascular insufficiency.

erectile response in that it produces an objective, permanent record of rigidity as well as tumescence and monitors the responses at both the base and the tip of the penis.

We found the penile brachial index to be of little use, since 38 of the 40 studies were normal despite documented erectile failure. This index incorporates the blood pressure in the dorsal arteries, which do not supply the corpora cavernosa, so significant vascular insufficiency or venous leak may be present yet undetectable.^{8,9} When injected into the cavernous bodies, papaverine induces relaxation of the smooth muscle,^{10,11} reducing resistance to arterial inflow and increasing resistance to venous outflow,¹² as demonstrated by postinjection cavernosograms.¹³ The simplicity of this test makes it an excellent screening tool in men with erectile dysfunction.^{13,14} For example, patients with psychogenic impotence respond readily to papaverine, and those with neurogenic impotence respond more favorably to a smaller dose than do those with vasculogenic impotence.¹⁵ We also were able to identify patients with probable venous shunts or leaks, as they responded to papaverine but quickly had detumescence. The same results have been reported by others.¹⁶ However, the diagnosis should be confirmed by a cavernosogram before surgery is undertaken, at least until further data become available. A positive response to papaverine indicates that the patient does not have vasculogenic impotence;¹⁷ nocturnal penile tumescence studies can then be used to distinguish neurogenic from psychogenic impotence.

In conclusion, the Rigiscan instrument is ideal for evaluating erectile dysfunction, since it provides an objective measure of both rigidity and tumescence throughout the penis. In conjunction with intracorporeal papaverine injection, the machine greatly facilitates the evaluation and in some cases treatment of impotence.

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