pneumoconiosis. He judges that category A has a similar survival rate to less severe categories, but his method of measurement may disguise the effects of the disease. A pneumoconiosis sufferer may perhaps change from face work to surface work or slow down his life in general. He may therefore survive longer, but only at the expense of loss of earnings and enjoyment of life. Observed survival rates and expectation of life may then be similar to those of non-sufferers, but only through this slowing down.

There is also some difficulty about the actual data presented. One would expect the first age group, probably also the second, to survive 20 years even with category A pneumoconiosis. Survival rates for these groups should not lend weight to conclusions for older groups, and since the last age group has so few subjects in many of its categories, it can be discarded. The evidence appears to be shrinking.

The 55-65-year age group does show a significantly lower survival rate in category A; at 15% it is lower than in the less severe cases, which range from 22 to 30%. Also the remaining two age groups display some strange variations. In the 45-55-year group there is a low (50%) survival rate for miners and ex-miners without pneumoconiosis and a very high rate (67%) for category 3. With such variation within the group it seems difficult to conclude that category A has the same survival rate as the other, less severe categories. In the 65-75-year age group category A shows the highest survival of all at 24%, which is strange when there does seem to be a downward progression for the other categories.

My final point is that the figures might also be explained in terms of the substantial reduction in the manpower of the coal industry since 1951. If a significant number of those in category A in 1951 left mining, they would have lived longer; the survival rate for category A may thus appear similar to those for less severe categories, but again the effects of the disease may be disguised.

In conclusion, Dr. Cochrane's "reasonable suggestion" seems at best premature, and at worst positively misleading. There are serious doubts as to whether his figures support his views, and so further evidence is required. —I am, etc.,

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Edrophonium in Diagnosis of Cholinergic Crisis

SIR,—I think Dr. C. W. H. Havard (25 August, p. 439) underestimates the hazards of injecting 10 mg edrophonium intravenously as a diagnostic test of cholinergic crisis in myasthenia gravis. The possibility of a cholinergic crisis usually arises in severely affected patients taking more than 20 anticholinesterase tablets daily, who become suddenly weaker over a matter of hours. If this weakness is due to under-treatment, 2 or 3 mg edrophonium is usually enough to obtain an improvement, and the absence of improvement after 5 mg (except in the few patients already known to need a higher dose) is good evidence that the sudden weakness is not due to under-dosage. Giving 10 mg edrophonium to a patient who is already close to paralysis from

overdosage may cause failure of respiratory and bulbar muscles, combined with an out-pouring of saliva and bronchial secretions, that can asphyxiate him. Even a patient who is underdosed, so that edrophonium improves his respiration, may expire two minutes later when the edrophonium wears off leaving the chest full of secretions. In these circumstances I think atropine should always be given intravenously before the edrophonium test and facilities for immediate endotracheal intubation must be at the bedside. These complications may theoretically be "unlikely," but even in units in which myasthenia is frequently seen they do occur.—I am, etc.,

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Sterility after Vasectomy

SIR,—Two recent reports have added to the controversy of post-vasectomy management. On the one hand, Professor J. P. Blandy and Mr. A. Halim (14 July, p. 110) have stressed that surgeons should be cautious in their interpretation of the findings of occasional non-motile spermatozoa in semen examined after this procedure, since vital staining has shown that not all immotile sperm are dead. On the other hand, Mr. D. Urquhart-Hay (18 August, p. 378) in describing the effect of irrigating the vas with a 1:1,000 solution of euflavine, has reported that semen analysis is unnecessary since no motile sperm were found in specimens examined by light microscopy.

Professor Blandy and Mr. Halim also refer to the fact that sperm in frozen semen used for artificial insemination are never motile after thawing. However, it may be incorrect to draw a direct analogy with the situation after vasectomy, for in those individuals who have occasional non-motile spermatozoa present for months afterwards the numbers present are so few that accurate total counts are not worthwhile. The question raised is whether occasional immotile spermatozoa, dead or alive, have a practical fertile potential when present in such small numbers, since the association between male infertility and oligospermia is accepted.

It is still our contention that this finding is likely to be of little significance, provided the operation has been performed correctly and the procedures undertaken have minimized the possibility of recanalization occurring, since we are unaware of pregnancies resulting from men who have failed to provide specimens at three months for analysis, or from a group of men who had an occasional non-motile spermatozoon reported for several months and then abandoned contraceptive precautions. It was these aspects that prompted the provocative suggestion¹ that post-vasectomy counts may be unnecessary provided 20 ejaculations have occurred, since there is an association between the frequency of emission and the number of sperm present.² This policy is rational if it can be ascertained that the number of sperm present following this are invariably so few that total counts are not significant and that any sperm present are not effectively fertile in such numbers.

As far as irrigation of the vas is concerned, we have previously reported³ that this pro-

cedure, using distilled water, effectively reduces the number of positive counts found three months later. An extension of this study has shown that two-thirds of individuals are sterile as soon as four weeks after operation as assessed by failure to demonstrate sperm in a plain film of semen.⁴ Mr. Urquhart-Hay, using euflavine, failed to show motile sperm in all specimens, examined within two hours of emission using the same technique of analysis reported in our study.⁵ However, semen was not examined at set times but at varying intervals up to 158 days. The total counts reported were in excess of 20 million/mm³ in 13% of subjects and above 5 million/mm³ in an additional 7%, but we assume these were examined soon after the operation or in subjects who had ejaculated infrequently. Despite this, immediate sterility was claimed.

We share the caution expressed by others in considering those with excessive counts to be infertile if a reasonable percentage of immotile sperm are viable, until such time as further studies fail to show pregnancies resulting following this procedure, or until the significance of immotile viable spermatozoa in varying numbers is demonstrated.

The value and acceptability of vasectomy is that in general it is a simple surgical procedure, but it has obvious limitations in some instances if long term surveillance is considered necessary before sterility is pronounced, especially if the criteria used to assess this are based on inaccurate premises. Therefore, we still feel there is a need for interested bodies to decide on the most rational approach to post-vasectomy management.

The medicolegal implications of not performing sperm counts when a spermicidal preparation is used for irrigation are of obvious importance, for at present two consecutive negative counts are generally considered desirable. Previously, we obtained an indication that examination of a plain film of semen, rather than of a centrifuged deposit, is legally acceptable,⁵ provided this is the practice of a body of responsible surgeons. If the policy undertaken by Mr. Urquhart-Hay is generally adopted by other surgeons, will this then have the same validity?—We are, etc.,

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¹ Craft, I., and Diggory, P., *Lancet*, 1973, 1, 663.

² Freund, M., and Davis, J. E., *Fertility and Sterility* 1969, 20, 163.

³ Craft, I., and McQueen, J., *Lancet*, 1972, 1, 515.

⁴ Craft, I., *British Journal of Urology* (in press).

⁵ Addison, P. H., *Lancet*, 1972, 2, 384.

SIR,—Mr. D. Urquhart-Hay states in his interesting paper (18 August, p. 378) that irrigation of each vas with 2.5 ml of 1/1,000 solution of euflavine destroys all sperms and "eliminates the necessity for examining two consecutive specimens of semen for azoospermia after operation." However, sperm counts three months after "vasectomy" are occasionally within the normal range.