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LONGFUNKSIE-PROEWE

Gedurende die afgelope 2 dekades het meer as 700 skrywers artikels oor hierdie onderwerp gepubliseer wat van so 'n gehalte was dat hulle een of meer male aangehaal is in ander artikels. Die belangrikstes is versprei in 43 verskillende mediese tydskrifte sonder enige konsentrasie in enige besondere een. Tog is dit slegs die herhaling van die belangstelling in hierdie onderwerp wat nuut is en nie die belangstelling as sodanig nie. Sir Humphry Davy het reeds 100 jaar gelede die residuele volume van die long bepaal met behulp van 'n vreemde gas (waterstof) en terselfdertyd die tyd van gasmenging in die longe bepaal.

Sedert 1940, as gevolg van die impetus van navorsing op die gebied van die fisiologie van stratosfeer-vlugte en lugvaart-geneeskunde en die ontwikkeling van thorakale chirurgie, het ons kennis van respiratoriese fisiologie met rasse skrede gevorder. Die bydrae wat hierdie studierigtings tot ons begrip van longsiektes gemaak het, is van geen geringe waarde nie. Weliswaar het dramatiese ontdekkings en verreikende omwentelings nie voortgespruit uit hierdie toetse nie, maar dit het ons begrip van die patologiese fisiologie in toestande soos emfiseem, diffuse longfibrose en bronchospasma tog op 'n rasionele basis geplaas. Algemene indrukke kan nou aan objektiewe maatstawwe getoets word en ons terapie in hierdie gevalle kan objektief na waarde geskat word.

Wat om presies van longfunksie-proewe te verwag, en wat nie, is reeds in 1951 deur Comroe opgesom.[1] Dit kom daarop neer dat hierdie toetse slegs die fisiologiese afwykings aandui, nuttig is as 'n hulpmiddel by die diagnose van sekere hart-long-afwykings en in die differensiasie tussen histeriese en organiese hiperventilasie. Diffuse stoornisse, en meer spesifiek die alveolêre-kapillêre blok-sindroom, kan hierdeur gediagnoseer word. Soos reeds genoem, kan die resultate van terapie beoordeel word en gevalle kan objektief opgevolg word. Daarenteen kan 'n anatomiese diagnose nie verwag word nie. 'n Kortsluiting kan bv. vasgestel word, maar of dit intra-kardiaal of intra-pulmonaal geleë is, kan nie hierdeur vasgestel word nie. Daar is geen *enkele* genoegsame toets nie (omdat die funksie van die long veelvuldig is). 'n Gevolgtrekking kan slegs uit 'n battery toetse gemaak word. Dit geld natuurlik ook vir enige orgaan waarvan die fisiologiese funksies bepaal word bv. lewerfunksie-proewe ens.

Donald[2] het in 1953 die funksie van die longe soos volg gedefinieer (vry vertaal): ‚Die handhawing in die arteriële bloed van 'n normale en byna konstante suurstof- en koolsuurgas-inhoud en spanning onder alle fisiologiese toestande, terwyl die funksie uitgevoer word sonder enige sensasie van ventilasie-ongemak of nadelige effek op die hart of ander organe.' As mens in ag neem hoe 'n algemene simptoom dispnee is, hoe dikwels sianose klinies waargeneem word, en hoe moeilik dit soms is om die oorsaak wat hiervoor verantwoordelik is, vas te stel, kan 'n indikasie van die waarde van hierdie proewe verkry word.

Hier in Suid-Afrika is die baanbrekerswerk op hierdie gebied deur Becklake en medewerkers gedoen en waardevolle werk wat plaaslik en oorsese erkenning geniet, is deur hulle gedoen. Tans is by alle opleidingshospitale in Suid-Afrika ook 'n funksionerende longfunksie-eenheid, en die volgende logiese stap sou die navolging wees van hierdie voorbeeld deur kleiner hospitale, op miskien 'n kleiner skaal.

Die uitrusting van so 'n eenheid hang af van tot watter mate navorsingswerk, en tot watter mate kliniese werk, gedoen sal word. Etlike jare lank het die afdeling vir thorakale siektes van die Amerikaanse Mediese Vereniging 'n uitstalling gereël om die basiese metodes in praktiese longfunksieproewe te demonstreer, veral met die oog op wat in die spreekkamer en kleinere klinies—fisiologiese laboratoriums gedoen kan word.[3] Hoewel 'n omvattende handboek oor hierdie onderwerp, met genoemde oogmerk in gedagte, nie beskikbaar is nie, kan die beginsels en basiese informasie gevind word in die monogram van Comroe, *et al.*[4] en die hoofstuk in Bickerman en Barach se boek[5] is spesiaal met hierdie doel vir hierdie geneeshere saamgestel. Hierdie literatuur gee ook breedvoerige, uitgesoekte verwysings na die uitgebreide literatuur oor die onderwerp.

Af en toe word nog deur sommige sogenaamde ‚praktiese' kollegas na hierdie toetse verwys as 'n ‚akademiese speelding'. Lank voor Harvey die sirkulasie van die bloed beskryf het, was toernikette in algemene gebruik. Waarskynlik het Harvey se eksperimentele waarnemings dus ook vir sy ‚praktiese' tydgenoot as ‚akademiese' tydverspilling voorgekom. Ons is egter vandag gelukkig in 'n posisie om te beweer dat hierdie akademiese werk op die lange duur van meer praktiese waarde as die toerniket was. Dit is ook nie lank gelede nie dat hart-kateterisasie Forsmann onder sy kollegas ongewild gemaak het, en dat elektrokardiografie beperk was tot opleidingshospitale en navorsingsinrigtings.

1. Comroe, J. H. Jr. (1951): Amer. J. Med., **10**, 356.
2. Donald, K. W. in Arnott, W. M. ed. (1953): *Respiratory Function Estimation for the Physician in Pulmonary Circulation and Respiratory Function.* Edinburgh en Londen: Livingstone.
3. Meneely, G. R. (1957): Dis. Chest, **31**, 125.
4. Comroe, J. H. *et al.* (1955): *The Lung: Clinical Physiology and Pulmonary Function Tests.* Chicago: Yearbook Publishers.
5. Meneely, G. R. en Callaway, J. J. in Bickerman, A. L. en Barach, H. A. (1956): *Pulmonary Emphysema.* Baltimore: Williams en Wilkins.

POLIOMYELITIS VACCINES

In its Second Report[1] the WHO Expert Committee on Poliomyelitis reviews the progress made in various fields of poliomyelitis during the past 3 years. The Committee (*inter alia*) reports what has been done to prevent paralytic poliomyelitis by the use of inactivated vaccine (Salk type) and also the position as regards the use of live attenuated strains

of poliovirus, hitherto tried on human subjects in experimental studies only. In view of the favourable results of these studies the Committee advises that carefully supervised field trials should be carried out with the live vaccine.

Reviewing the poliomyelitis situation in various countries during the last 3 years, the Committee reports in several 'a notable increase in the incidence of paralytic cases, often to epidemic proportions', giving rise to fears that this 'heralded a period in which epidemics would recur at intervals and possibly increase in extent and severity'. South Africa is one of the countries in which such an increase has been experienced. Here there was a prolonged and severe epidemic during these years extending for the first time to Natives also, amongst whom nearly all the cases were in children under 6—the majority under 3. In the Europeans, children of older-age groups were affected almost as severely as those of the 0-5 year age-group, and there were a large number of cases in adults, many ending fatally. The Committee goes on to state, however, that 'a notable reduction has been reported from other countries and in many, but not all, this reduction has been associated with mass immunization'.

In the USA over 70 millions of inoculations of the Salk vaccine were administered in 1956 and the effectiveness has been shown by a shift in the age distribution of paralytic cases. The relative incidence in the 0-4 year age-group increased, while that in the 5-9 year age-group, which had been more extensively vaccinated, decreased. At least a half of the American population under 20 years of age received one or more doses of vaccine, and the reduction of cases of paralysis in the vaccinated group as compared with the non-vaccinated was estimated at 73%. A careful evaluation was also made in Great Britain. Here, where in 1956 it was found possible to complete the course of vaccination in 148,684 children, the incidence of paralytic disease in the vaccinated was about one-fifth of that in the unvaccinated.

The Expert Committee records that large-scale vaccination with inactivated vaccine was also undertaken in Australia, Canada, Denmark, Israel, Sweden, and South Africa, and important but less extensive programmes in a number of other countries. In Australia 2,200,000 out of the 2,500,000 children under 15 had received 1 or 2 injections (nearly all 2) by June 1957. In Denmark since 1955 practically the whole population up to 20 years old had been inoculated (by the intradermal route) as well as a large proportion of the up to 40 years old. In 1957 the whole child population of Israel between 6 months and 3½ years old had been intradermally vaccinated; and in Sweden about 75% of children aged 4-11 by the subcutaneous route. In South Africa the report records that 500,000 children had received 2 doses of vaccine at intervals of 3-6 months between injections, and that all individuals, of whatever age, who wished to be vaccinated had received at least one inoculation. The supply of vaccine prepared in the Union had been supplemented in 1957 by supplies from the USA. (The Union Minister of Health stated on 21 August 1958 that between April and June this year 751,000 doses of vaccine were produced in South Africa and that so far 2,122,000 doses had been issued.)

In Australia, Canada, South Africa, and the UK, in all of which poliomyelitis was prevalent, it was possible to make an estimate of the extent of protection afforded by vaccination. In all of them the evidence pointed to a protective effect of the same order of magnitude as that observed in the US, where in 1956 it was estimated at 73%. Reactions following vaccination were few and generally mild. On the question of the possible precipitation of an attack of paralytic poliomyelitis, there appeared in the USA to be no undue incidence within 30 days of injection, nor were the cases showing a correlation between the site of injection and the site of paralysis more numerous than might be expected as the result of chance. No evidence was forthcoming contra-indicating the pursuance of vaccination campaigns while poliomyelitis is locally prevalent, but both in South Africa and the USA vaccination in the face of an epidemic did not appear to shorten its course. The Committee emphasizes that persons vaccinated with inactivated vaccine in the ordinary way are no less liable than the non-vaccinated to have an alimentary infection and to excrete poliovirus from the bowel.

Live-virus Vaccine. Polioviruses of all 3 types have been isolated by the plaque technique which possess only minimal residual neurotropism to monkeys and multiply in the alimentary canal of unimmunized human subjects, leading to the formation of antibodies in a similar way to natural infection with poliomyelitis. As indicated above, the Expert Committee expresses a strong opinion that the time has come when controlled field trials of such vaccines should be undertaken on a considerable scale. Preliminary tests by several investigators have shown no harmful effects and the Committee feels that information is badly needed which can only be obtained by more extensive field trials. The Committee is careful to say that it is not its intention 'that the use if attenuated strains should displace the use of an inactivated-virus vaccine in any of the areas where it is currently being used or will be used shortly, but rather that it should supplement it or substitute for it in areas where the use of the inactivated-virus vaccine is not feasible'. The Committee mentions circumstances which it believes suitable for such a trial. Amongst these it refers to conditions in which it is desirable to reinforce the immunity previously produced by an inactivated-virus vaccine, where the value of the procedure would be to enhance the humoral antibodies and also to induce resistance within the alimentary tract. The Committee suggests that such trials should be supervised by an individual experienced in poliovirus investigations, with adequate laboratory facilities and the assistance of other virologists as consultants; and it lays down technical criteria which it considers should be satisfied in the selection of strains for use. It would appear that South Africa is well equipped to comply with the suggested conditions.

In conclusion the Committee stresses that these trials are recommended in the belief that they may further reduce the prevalence of poliomyelitis. It says: 'Should these live-attenuated-poliomyelitis trials be successful, not only do they carry with them the hope that a more solid immunity against poliomyelitis might be achieved, but the possibility of eliminating or reducing the movement of virulent poliovirus within a given community might be realized—a result which the inactivated-virus vaccine does not achieve.'

A preliminary report has now come to hand of a large field trial with live attenuated virus recently carried out by Koprowski[2] and his associates in the Belgian Congo and Ruanda-Urundi. Here type-1 poliovirus had been incrimin-

ated in outbreaks of paralytic poliomyelitis and all but about 12% of the population were found to have serum antibodies against type-1 poliovirus (Chat strain). Nearly a quarter of a million persons, including adults and children —mostly Natives in the Rizizi Valley, received one dose of attenuated type-1 poliovirus (Chat strain), administered by the mouth as a liquid. No signs of illness were observed in any of the recipients, and 2 months after this vaccination all but two of a group of nearly 300 school-children who had shown no type-1 antibodies before vaccination were found to have developed determinable serum antibodies against type-1 poliovirus. Some 2,500 persons, mostly children, also received oral vaccination with type-3 poliovirus (Fox III strain), and the results as regards absence of reaction and the development of the homologous antibodies were the same.

Outbreaks of poliomyelitis in 4 Congo villages which occurred during the field trial enabled this form of vaccination as a method of suppressing epidemic prevalence to be tested. In the village of Banalia 8 cases of paralytic poliomyelitis (all in Native infants and children under 5 years old) were observed during a period of a little over a month, attributed on the evidence of complement fixation to type-1 virus. The total population of the village was 4,182 and the children under 5 numbered 674. Five days after the last cases appeared vaccination was started in Banalia and type-1 (Chat) virus was administered *to every inhabitant*. No more cases of paralytic poliomyelitis were observed in the village up to the time of the report. In the other 3 villages similar outbreaks arose and the same oral vaccination was administered within 5 days of the last cases appearing. Every inhabitant received the vaccine and after the 4th post-vaccinal day no new paralytic cases were observed.

Further details must be awaited of this experiment in Central Africa. If its early promise is confirmed and similar results are obtained with the other strains of the virus, oral vaccination may be expected to play an important, possibly a decisive, role in the campaign against dreaded poliomyelitis.

1. Expert Committee on Poliomyelitis (1958): *Second Report*, Wld. Hlth. Org. Tech. Rep. Ser. No. 145. Besides the *First Report—Idem* (1954): *Ibid.*, 81—a preliminary review of poliomyelitis vaccination has been published by the same committee—*Idem* (1956): *Ibid.*, 101.
2. Courtois, C., Flack, A., Jervis, G. A., Koprowski, H. and Ninane, G. (1958): Brit. Med. J., 2, 187.