

Key messages

- The incidence of testicular cancer has increased in the past 50 years, and there is some evidence to suggest that sperm quality has decreased in the same period
- It has been hypothesised that common aetiological factors may exist for testicular cancer and for male subfertility
- The association between male subfertility and subsequent risk of testicular cancer is strong and consistent with the hypothesis of a common aetiology
- The association is similar for seminoma and non-seminoma, and it persists when several potentially confounding factors are taken into account

from analytical epidemiological studies of testicular cancer, which have shown consistent associations with low birth weight^{14 22} and with congenital malformations of the male sexual organs.^{13 23}

In patients with testicular cancer who are treated by surgery alone low sperm counts and high values of follicle stimulating hormone were observed at the time of orchidectomy and during the following years.^{24 25} In addition, studies of testicular tissue from such patients have shown that abnormal morphology and impaired spermatogenesis are common features, both in the testicle with cancer²⁶ and in the contralateral testicle.²⁴ This probably reflects a condition of permanently impaired reproductive capacity that precedes and is not caused by the presence of a tumour in the other testicle.

Conclusion

We found that testicular cancer occurs more commonly in men who have fathered no or only few children when the age of the man is taken into account. In conjunction with studies of testicular histology and function these data support the hypothesis that male subfertility is associated with a high risk of testicular cancer. The most plausible explanation for this association is the existence of causal factors that are common to both subfertility and testicular cancer. The epidemiology and biology of testicular cancer suggest that such common causes may act prenatally.

Lars Grønberg assisted with the data analysis.

Contributors: HM was responsible for the study design, data collection, statistical analysis, interpretation, and reporting. NES contributed to the study design, interpretation, and reporting. Both authors are guarantors.

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Competing interests: None declared.

- 1 Coleman MP, Esteve J, Damiecki P, Arslan A, Renard H. Trends in cancer incidence and mortality. *IARC Sci Publ* 1993;121:521-42.
- 2 Forman D, Møller H. Trends in incidence and mortality of testicular cancer. *Cancer Surv* 1994;19/20:323-41.
- 3 Adami HO, Bergstrom R, Møhner M, Zatonsky W, Storm H, Ekblom A, et al. Testicular cancer in nine northern European countries. *Int J Cancer* 1994;59:33-8.
- 4 Bostofte E, Serup J, Rebbe H. Has the fertility of Danish men declined through the years in terms of semen quality? A comparison of semen qualities between 1952 and 1972. *Int J Fertil* 1983;28:91-5.

- 5 Bendvold E. Semen quality in Norwegian men over a 20-year period. *Int J Fertil* 1989;34:401-4.
- 6 Carlsen E, Giwercman A, Keiding N, Skakkebaek NE. Evidence for decreasing quality of semen during past 50 years. *BMJ* 1992;305:609-13.
- 7 Auger J, Kunstmann JM, Czyglik F, Jouannet P. Decline in semen quality among fertile men in Paris during the past 20 years. *N Engl J Med* 1995;332:281-5.
- 8 Irvine S, Cawood E, Richardson D, MacDonald E, Aitken J. Evidence of deteriorating semen quality in the United Kingdom: birth cohort study in 577 men in Scotland over 11 years. *BMJ* 1996;312:467-71.
- 9 Pajarinen J, Laippala P, Penttila A, Karhunen PJ. Incidence of disorders of spermatogenesis in middle aged Finnish men, 1981-91: two necropsy series. *BMJ* 1997;314:13-8.
- 10 Henderson BE, Benton B, Jing J, Yu MC, Pike MC. Risk factors for cancer of the testis in young men. *Int J Cancer* 1979;23:598-602.
- 11 Skakkebaek NE, Berthelsen JG, Giwercman A, Müller J. Carcinoma-in-situ of the testis: possible origin from gonocytes and precursor of all types of germ cell tumours except spermatocytoma. *Int J Androl* 1987;10:19-28.
- 12 Møller H. Clues to the aetiology of testicular germ cell tumours from descriptive epidemiology. *Eur Urol* 1993;23:8-13.
- 13 United Kingdom Testicular Cancer Study Group. Aetiology of testicular cancer: association with congenital abnormalities, age at puberty, infertility, and exercise. *BMJ* 1994;308:1393-9.
- 14 Møller H, Skakkebaek NE. Testicular cancer and cryptorchidism in relation to prenatal factors: case-control studies in Denmark. *Cancer Causes Control* 1997;8:904-12.
- 15 Sharpe RM, Skakkebaek NE. Are oestrogens involved in falling sperm counts and disorders of the male reproductive tract? *Lancet* 1993;341:1392-5.
- 16 Storm HH. The Danish cancer registry: a self-reporting national cancer registration system with elements of active data collection. *IARC Sci Publ* 1991;95:220-36.
- 17 Breslow NE, Day NE. Statistical methods in cancer research. Vol I. The analysis of case-control studies. *IARC Sci Publ* 1980;32:5-338.
- 18 Armstrong BK, White E, Saracci R. *Principles of exposure measurement in epidemiology. Monographs in epidemiology and biostatistics*. Vol 21. Oxford: Oxford University Press, 1992.
- 19 MacMahon B, Cole P, Lin TM, Lowe CR, Mirra AP, Ravnihar B, et al. Age at first birth and cancer of the breast. A summary of an international study. *Bull World Health Organ* 1970;43:209-21.
- 20 Møller H, Skakkebaek NE. Risks of testicular cancer and cryptorchidism in relation to socio-economic status and related factors: case-control studies in Denmark. *Int J Cancer* 1996;66:287-93.
- 21 Bergstrom R, Adami HO, Møhner M, Zatonsky W, Storm H, Tretli S, et al. Increase in testicular cancer in six European countries: a birth cohort phenomenon. *J Natl Cancer Inst* 1996;88:727-33.
- 22 Akre O, Ekblom A, Hsieh CC, Trichopoulos D, Adami HO. Testicular nonseminoma and seminoma in relation to perinatal characteristics. *J Natl Cancer Inst* 1996;88:883-9.
- 23 Møller H, Prener A, Skakkebaek NE. Testicular cancer, cryptorchidism, inguinal hernia, testicular atrophy, and genital malformations: case-control studies in Denmark. *Cancer Causes Control* 1995;7:264-74.
- 24 Berthelsen JG, Skakkebaek NE. Gonadal function in men with testis cancer. *Fertil Steril* 1983;39:68-75.
- 25 Hansen PV, Trykker H, Helkjær PE, Andersen J. Testicular function in patients with testicular cancer treated with orchidectomy alone or orchidectomy plus cisplatin-based chemotherapy. *J Natl Cancer Inst* 1989;81:1246-50.
- 26 Ho GT, Gardner H, DeWolf WC, Loughlin KR, Morgentaler A. Influence of testicular carcinoma on ipsilateral spermatogenesis. *J Urol* 1992;148:821-5.

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Corrections

Recent advances: Neurosurgery

In this article by Michael Powell (2 January, pp 35-8) reference 11 was incorrect and should have read:

Powell MP, Torrens MJ, Thompson JLG, Horgan JG. Isodense colloid cysts of the third ventricle. A diagnostic and therapeutic problem resolved by ventriculocopy. *Neurosurgery* 1983;13:234-7.

Obituary

Dr Leslie Ely ("Peter") Lucas (16 January, p 198) was an originator and trustee of the Huddersfield Postgraduate Centre, not the Huddersfield Medical Society.

Smoking cessation: evidence based recommendations for the healthcare system

In this article by Martin Raw et al (16 January, pp 182-5) the name of Gay Sutherland (clinical psychologist from the Maudsley Smokers Clinic, London) should have been included in the list of reviewers at the end.