Physical activity, immobilization and the risk of venous thrombosis

Stralen, K.J. van

Chapter 2

The tortuous history of the implementation of early ambulation after delivery.

KJ van Stralen*, EM Terveer*, CJM Doggen,
FM Helmerhorst, JP Vandenbroucke.

Journal of the Royal Society of Medicine, 2007 feb; 100 (2):90-96

*both first authors contributed equally to this manuscript.

Abstract

At the beginning of the twentieth century, venous thrombosis was a major complication during puerperium. It occurred in almost eight out of 1000 postnatal women and was fatal in about a third of the cases. Around 1900 women were told to stay in bed until the 28th day. Nowadays women are advised to get out of bed as early as possible in order to prevent thrombosis. We therefore studied what led to early mobilisation after delivery.

Published studies identified via searches of literature databases MEDLINE, EMBASE, Web of Science, Scopus, Index Medicus, Dutch Central Catalogue, consecutive editions of generally used British, American and Dutch obstetrics and gynaecology textbooks, old volumes of The Lancet and the Dutch 'Nederlands Tijdschrift voor Geneeskunde'

In 1878, the German gynaecologist Küstner promoted early ambulation, which was embraced by other German gynaecologists. After a short period of cautious implementation, the practice of early mobilisation disappeared. This was due to new theoretical arguments and anecdotal cases of fatal pulmonary embolisms upon mobilisation. The Second World War and the baby-boom meant that there was pressure on hospital maternity beds, resulting in practical reasons for early discharge of the mother. After WWII the reserved attitude against early ambulation began to disappear. Nevertheless, it took until the 1980s before the practice of early mobilisation was universally applied.

Even though a reduction in venous thrombosis and overall morbidity were the primary reasons for implementation of early ambulation, no accurate risk estimations of its effect have been made. The final implementation was mainly due to practical reasons.

Introduction

One of earliest known risk factors for venous thrombosis is pregnancy. As long ago as 1718 Mauriceau described the "milk leg". He suspected that in pregnant women a venous thrombosis in the leg was caused by "redundancy and metastasis" of breast milk causing the swelling and pain.[1,2] This idea lasted for more than a century and is generally accepted as the first description of a venous thrombosis.[2] It was not until the 1850s that people realised venous thrombosis was not only a disease of women during or after pregnancy.[2] By the beginning of the 20th century venous thrombosis occurred in approximately eight out of 1000 women who had just given birth and was fatal in about a third of the cases.[3]

For a long period, even until after the Second World War, most clinicians believed that venous thrombosis was an infectious disease and could be contagious.[4] In 1856 Virchow described venous thrombosis as a disease caused by clotting of the blood.[5] He developed the now famous 'Triad of Virchow' in which he described three major causes for venous thrombosis - damage to the vessel wall, changes in the blood composition, and slowing down of the bloodstream. Currently it is believed that the latter two risk factors are the most important for venous thrombosis. During pregnancy and shortly after delivery coagulation factors are increased which ensures that bleeding during delivery is not prolonged.[6] At the end of the pregnancy, the velocity of the bloodstream also falls by 50 % [7,8] due to compression of the inferior vena cava.[7,9] To ensure that the circulation returns to normal after childbirth, women are nowadays stimulated to get out of bed as early as possible. However, even though stasis had been postulated as a potential cause of venous thrombosis as early as 1856, early ambulation only became widely accepted after the Second World War, whilst immediate ambulation after delivery has only become a general rule since the 1980s. In the Netherlands gymnastic exercises starts on the first day after delivery.[10] Women are advised to get out of bed early and bruises, piles, and stitches are no reason not to participate. After a caesarean delivery exercises start on day two.[10]

Given that Virchow postulated the risk of venous stasis in 1856, and pregnancy was known to be an important risk factor for venous thrombosis, why was it not until the 1980s before early ambulation after delivery was generally implemented in hospitals? On what evidence was early mobilisation based? These questions are the focus of our extensive literature search, the results of which are reported here.

Methods

A literature search was being performed using Medline containing one of the following words: pregnancy, puerperium, postpartum, post-partum, obstetric*, maternity, in combination with either ambulation, mobilisation, mobilization, bed rest, bedrest, exercise, move, moved, rise, rising or discharge. Medline was also checked for entries for “milk leg” and “phlegmasia alba dolens”. Similar terms were used in other bibliographic databases such as Embase, Web of Science, Scopus, and two journals, the Dutch “Nederlands

Tijdschrift voor Geneeskunde" and The Lancet. Furthermore, Index Medicus (1879-1950), and the Dutch Central Catalogue were searched using the terms gynaecology, gynaecologie, obstetrics and verloskunde. References cited in other articles were checked. Whenever available, German, English, French, Dutch and Czech articles were read in their original language. Consecutive editions of widely used American, British and Dutch obstetrics and gynaecology textbooks, published between 1930 and 1975, were read and references cited in these books were traced if the topic concerned immobilisation after childbirth. We interviewed well-known Dutch obstetricians, namely Prof. Dr J.F. Schutte (in practice from 1930 to 1975) and Prof. Dr H.J. Huisjes (in practice from 1960 to 1990), Prof. Dr P.E. Treffers (who remains in practice, having started in 1965), and Prof. Dr J. Bennebroek-Gravenhorst (who remains in practise, having started in 1968). Most research in obstetrics and gynaecology at the end of the 19th and beginning of the 20th century was performed in Germany and other European countries. The discussion emerged in the US literature only shortly before the Second World War.

1777 to First World War

In 1777 an English obstetrician, by the name of Charles White, in his treatise on the Arrest of Puerperal Fever, recommended early mobilisation after delivery.[2,11] However this recommendation was not followed by other obstetricians and disappeared.[2,12] Gooch, also from Great Britain, held the opposite opinion in 1820; this professor of obstetrics cautioned his student obstetricians not to allow their patients out of bed before the 21st day after delivery.[11] At the end of the 19th century women were advised to stay in bed for 28 days.[13] Around 1900 German gynaecologists started early mobilisation. This was based on the finding of Küstner in 1878.[14,15] He wanted to reduce the risk of infection in women after childbirth. He wondered whether this risk could be reduced if women had the same "bed regimen" after giving birth as healthy individuals, so he decided to encourage women to get out of bed at an early stage. He found less fever in these women and moreover did not find any deep venous thrombosis in 600 women who were mobilised on the first day after delivery, when eight cases would have been expected.[16] After this promising result other German obstetricians started to mobilise women at an early stage. The firsts to follow were Krönig and Bumm, who also reported beneficial results.[2,17-20] In 1902 Krönig found that in

a group of 416 women in his maternity clinic who were mobilized on the first day, no venous thrombosis or pulmonary embolism occurred (0 %). Amongst 146 women who stayed in until at least the 11th day, five had a venous thrombotic event (3.4%).[2] This led to the suggestion by Krönig that venous thrombosis was mainly caused by disturbances of the circulation.[16]

Bumm confirmed these results in 1907; he did not find any venous thrombosis among 900 women mobilized early.[2,16] Around 1911, Klein found no cases of venous thrombosis in 2524 women who were mobilized between the first and third day, whereas in 2500 women who stayed in bed until at least the ninth day, four venous thromboses and one fatal pulmonary embolism occurred.[2] Gauss found similar results among 600 women. He did not find a single case of venous thrombosis among women who had been mobilized early, compared with eight cases of venous thrombosis among the women who had remained in bed for at least six days, however it is not known how many women remained in bed for that period.[16] In all these studies, however relatively healthy women were allowed out of bed at an early stage, while the women who had fever and other complications were generally kept in bed for a longer period.

After these results many clinics, mainly German, adopted early mobilization, although every clinic had its own definition of early ambulation. While one clinic advised its patients to get out of bed on the first day after delivery, other clinics still spoke of "early ambulation" when women stayed in bed until the eighth day.[2] Prevention of venous thrombosis was not always the reason for early ambulation. In 1908, Hüffell, for example, mobilised his relatively healthy patients after four days to make it easier for them to return to daily life.[16] Before this change in practice, women were required to stay in bed until the eight day and went home the ninth day. At home the daily activities had to be resumed leaving women little time to re-acclimatise to normal life.[16]

Besides the positive effects of prevention of venous thrombosis and acclimatisation, some physicians like Hüffell[16], Velits[18], Simon[21] and Alvensleben[20] also saw other beneficial effects of early ambulation on general morbidity.[16,21] Among these postulated effects were more rapid involution of the uterus and genitals,[2,18] fewer uterine prolapses and

retroflexions, [16,21] less fever,[18] fewer pneumonias,[2] less blood in the lochia[18] and a better state of mind[2].

Despite these beneficial results in the early 1900s, European obstetricians became more careful in prescribing early ambulation after 1910. Four important reasons accounted for their reluctance. The main reason was that the abdominal organs were thought to be loosened by childbirth, and would put too much pressure on the uterus, increasing the risk of prolapses (Huisjes, Schutte, personal communication [11]). Our review of the literature did not show any evidence that staying in bed prevented prolapses. However, until long after the Second World War, this was the main reason for not to implementing early ambulation.[22]

A second reason was a publication by Fromme, head of the university maternity clinic in Halle, Germany. He described a single lethal case of pulmonary embolism due to, in his opinion, premature ambulation.[17] In 1908, after the experiences of Krönig and others, he had allowed women without fever or other complications to sit up in bed on the first day. One early ambulated woman died of a severe pulmonary embolism shortly after early mobilization. Since Fromme had never seen a lethal pulmonary embolism among his 6600 patients who had the old bed rest policy, he strongly advised caution in promoting early ambulation until more was known on the cause of pulmonary emboli.[17] This report was influential: most obstetricians acted less enthusiastically in prescribing early ambulation after delivery.[19] A third reason was that, although some German gynaecologists were convinced of the beneficial effects of early ambulation, some were afraid that a policy change would force women from the working class to return to their usual physical activities too early.[12,20,21] Finally, not all gynaecologists were convinced of the beneficial effects of early ambulation, as in most studies only the healthy women were allowed to get out of bed early.[21]

Gynaecologists in the United States were also reticent about early ambulation. In 1910 Mosher surveyed views about early ambulation among many important American obstetricians.[12] Most obstetricians did not allow women to get out of bed before the tenth day. However, compared to Great Britain and the Netherlands, women were more often

allowed to move freely in bed and to eat in the sitting position.[12,23,24] Most clinicians in the United States had heard about the German practice. Nevertheless, they did not believe it would be useful and they thought it could be dangerous. They reasoned that “as the practice (by White) did not find many imitators, it was not found advantageous”.[12] The appearance of several cases of lethal pulmonary emboli and the ideas that "rest is best" and "the American women of the better class were no comparison to the German peasantry" (Mosher, page 624) resulted in a more conservative approach in the United States.[12]

First to Second World War

Probably the first semi-randomised controlled trial for women during puerperium was proposed by Baird around 1930 when he worked as an assistant obstetrician in Glasgow, Great Britain. The legs of the women in that hospital were tied together for 14 days to prevent infection. Baird questioned the rationale of this regime and proposed that he might try, on alternate women after giving birth, not to tie the legs with binders and see what would happen.[25,26] According to one textbook, subsequent comparison of these women with those who had their knees tied did not show a benefit of tying the legs and the practice was discontinued.[26] However a second textbook suggests that this experiment was only proposed by Baird and that it is uncertain whether it was performed.[25]

Wichmann wrote in 1938 a manuscript promoting early ambulation after surgery and delivery.[19,27] He obtained his ideas from the studies done by Küstner and Krönig, as well as new studies done by Scherf.[19] Scherf had found in an autopsy series that deep veins were more often thrombotic in women who had a long bed rest compared to those with a short bed rest.[19] Wichmann implemented early ambulation in his clinic and saw many beneficial effects. Women themselves preferred it, and less overall morbidity was found. Eight months after the policy change not a single woman had experienced a venous thrombosis or pulmonary embolism.[19] In Helsinki, Finland, 4447 out of 4657 women were allowed out of bed within 48 hours after delivery between January 1938 and June 1939. Fewer cases of venous thrombosis (0.11%) were found compared to women who had to remain in bed for the usual length of time (0.41%) after delivery between 1927 and 1936.[11,27]

For a long time after the Second World War gynaecologists and obstetricians faced a dilemma. As it was becoming more and more accepted that early ambulation prevented the risk of venous thrombosis, they were also afraid that premature ambulation might lead to increased risks of prolapses of the uterus, bladder and even rectum (Huisjes, Bennebroek-Gravenhorst, personal communication[28]). This dilemma resulted in different approaches in different countries and hospitals. After a plea by Chalier, an advocate of early ambulation, a group of French clinics implemented early ambulation in the late 1930s.[19] In Britain and the United States it was usual to let the women stay in bed for approximately 7 to 14 days, however women were allowed to move freely in bed.[29-33] A remarkable fact is that gynaecologists in these countries did not advise elastoplast strapping or binders anymore, whilst in the Netherlands this was still common practice.

Second World War to 1950

New reasons to practice early ambulation arose during the Second World War. During the Blitz in 1940, women in a maternity hospital in London were encouraged to get out of bed on the first day, so that in case of a bombing they would be able to walk to the air-raid shelter themselves. Less morbidity, better involution and considerable less venous thrombosis occurred, although the latter was ascribed to the increased use of elastoplast strapping. It was believed that "a possible increased risk of prolapse was justified under these unusual circumstances".[34]

In the United States a shortage of hospital beds occurred in the beginning of the Second World War. A wartime baby boom occurred, because women wanted to have children by their husbands before they went overseas. This resulted in an increase in births from 18.4 per 1000 population in the 1930s to 22.7 per 1000 at the height of the baby boom in 1943.[35,36] The shortage of hospital beds became even more problematic, as not only rich women delivered in hospital, but other social classes could also afford a hospital stay. In 1935, 24.4% of the births took place in hospital, while this increased to 78.8% in 1945. Supported by findings of the London hospitals during the Blitz, the only way to solve the shortage problem was believed to be early discharge. However, since early discharge was affecting not only lower economic classes but also the middle classes, physicians had to

show that early ambulation was safe. In a hospital in Baltimore 150 women with no complications after normal childbirth were allowed out of bed on the third or fourth day postpartum. Women who got out of bed earlier, had better involution and a similar morbidity rate compared women with similar characteristics in a second hospital, in which the old bed rest regimen was practiced.[11,36]

The baby boom in Europe started after the Second World War, but it resulted in the same problems as had been experienced a few years earlier in the United States. In Britain there were too few maternity beds in hospital. As women were sent home on the fifth day it was important that they were able to do easy tasks themselves.[37] Half a day after delivery, women were stimulated to sit on the bedside and move their legs. Both physicians and patients eagerly accepted this policy. A survey showed that most general practitioners (69%) were in favour of early ambulation.[37] No differences in the occurrence of venous thrombosis were found in the new practice compared to the old regimen.[37]

Even though the acute shortage of hospital beds was an important problem for hospitals, not all agreed with the idea of early discharge. Hospitals were advised in the Journal of the American Medical Association not to discharge patients before the seventh or eight day and with printed instructions about their future care.[38]

1950 to 1980

Around 1950 the attitude of physicians and clinics to women giving birth changed. In Britain and the United States a transition occurred from late to early ambulation. Where some were reluctant to prescribe early ambulation[39-43] others were more progressive.[44-50] Women were no longer regarded as patients, and were restricted less.[13] Babies were allowed to be in the same rooms as their mothers, visitors were welcomed, and women were discharged at an early stage.[13] Many physicians allowed women to move in bed, and gave them a say when to get up. Most women left their bed on the first day to sit in a chair. After this transitional period, most British and American obstetricians were convinced of the negative effects of stasis of the blood on the risk of venous thrombosis and adjusted their policies. In the fifties it was common practice to leave bed on the first or second day after giving birth.

In contrast, in 1953, Mayes in Australia described early ambulation as a controversial, very old idea which had been abandoned years previously.[51] He required women to remain in bed for four or five days, probably because he was afraid that early mobilization would increase the risk of prolapses. Not withstanding this, he thought full ambulation at the earliest reasonable time after confinement was responsible for greatly reducing the morbidity of venous thrombosis.[51]

Some Dutch textbooks, such as that by Amesz published in 1963, still referred to mainly negative effects of early ambulation, such as prolapses and mentioned only a few negative effects after bed rest lasting eight to nine days.[52] However, during this time period more hospitals started implementing early ambulation in daily practice.[53-56] From 1958 onwards, women were advised to get out of bed at an early stage. From the first hours after delivery, women were allowed to move freely. From the second day onwards she was allowed to get out of bed for short periods, while later on women were allowed out of bed for longer periods of time. [53,54,57-60] Binders or elastoplast strapping were less often prescribed and usually bound not as tightly as in the old days.[56,61] From 1973 onwards binders were no longer advised.[55,60] Moreover, deliveries among otherwise healthy women with uncomplicated pregnancies in the Netherlands increasingly took place at home, and it can safely be assumed that all kinds of restrictions will have been somewhat less strict. Therefore, when a woman gave birth at home she would probably not have been in bed for the prescribed period. As only very healthy women gave birth at home, the occurrence of venous thrombosis in this group cannot be compared to that of those who gave birth in the hospital.

Bonnar showed that the number of lethal pulmonary emboli after delivery decreased in England and Wales between 1972 and 1981 compared with the situation in 1952. This was ascribed, among other reasons, to the policy changes regarding early ambulation, since the number of lethal pulmonary emboli during pre-partum period remained stable (figure 1).[7] A similar study by Treffers, also found a remarkable decrease in thromboembolic disease in the post partum period over the years. The main decrease of cases of venous thrombosis was seen in the years 1973 to 1979. However, the early ambulation policy had already been implemented in the late 1950s and early 1960s. Compared to 1952-1957, the 1958-1962

and 1963-1967 periods did not show any decrease in the occurrence of venous thrombosis (figure 1).[62] This led to the conclusion by van Bouwdijk-Bastiaanse that early ambulation did not help in reducing the risk of venous thrombosis.[63] The decrease in the seventies was ascribed to a decreasing age of pregnant women and to the provision of anticoagulant therapy to women who had a caesarean section.[62]

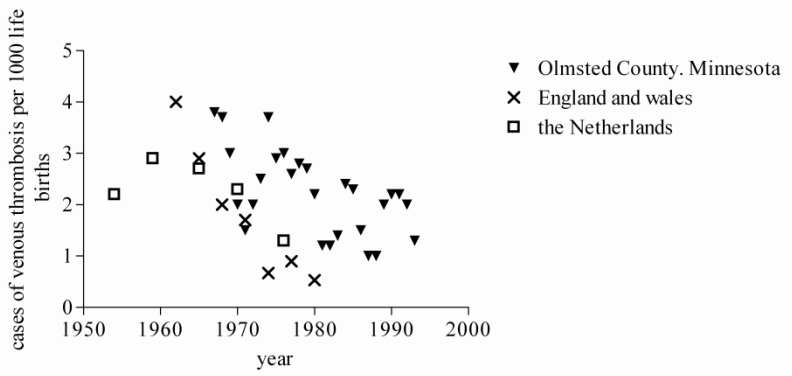

Figure 1. Trends over time for the incidence of venous thrombosis and pulmonary embolism among post partum women in three different countries.26,62,68,69

In Czechoslovakia, Dvorak performed a study in 1977 on the effects of early ambulation after delivery, much like the German obstetricians in the beginning of that century by comparing two time periods. From 1955 to 1964, 9774 women were kept in bed for six weeks. Two percent of them experienced a venous thrombosis: 0.09% a pulmonary embolism, 0.66% a deep venous thrombosis and 1.34% a superficial thrombophlebilis. From 1970 to 1975, 10235 women were mobilised within 24 hours after delivery. No deep vein thrombosis or pulmonary embolisms occurred, while only 0.34% of the women got a thrombophleblitis.[64] However, as with the other studies, no corrections for other changes in practice, like anticoagulation therapy, were taken into account.

1980 - to date

Nowadays it is generally accepted that early mobilisation has mainly advantages. Nevertheless, a number of new studies have been performed over the last few years, since the discussion started whether bedridden pregnant women should be prescribed prophylactic anticoagulants or stasis-reducing treatment. Since it is not justified anymore to keep healthy women in bed after giving birth to a child, most studies on early ambulation are performed with pregnant women who have to remain in bed for diseases or complications.[65] Small increased risks of venous thrombosis of extended bed rest have been found.[65-67] However, similar to studies performed in the beginning of the twentieth century, women who are obligatorily bedridden most often have a lesser health status, which results in a higher risk of venous thrombosis, compared to women who are allowed to leave the bed at an early stage. For this reason, still no accurate risk estimations have been made for comparable groups of women.

Discussion

After Virchow described venous stasis as a risk factor for venous thrombosis, German obstetricians started encouraging women to get out of bed early after childbirth. The first individual promoting this practice was probably Küstner in 1878. He was followed by only a few German obstetricians. However, other countries and obstetricians were reluctant for several reasons, of which fear of prolapses was the most important. Therefore the practice of early ambulation virtually disappeared.

The Second World War and the accompanying baby boom led to a shortage of hospital beds, resulting in a strong practical reason for early ambulation. Early ambulation was implemented in many hospitals. Since no negative effects were found, there was no reason to return to the old practice. After the Second World War a decrease was found in cases of post partum venous thrombosis. However, besides early ambulation, other factors, like anticoagulation and the age of child-bearing women, changed as well. Therefore it is not known whether early ambulation was responsible for this decrease.

We performed an extended literature review and we did not find studies which provided “evidence based proof” according to current standards. As most of the research discussed in

this article was old, mostly performed before the Second World War, it is possible that we may have missed some studies concerning this topic. However, we did check all the relevant references in articles and handbooks. Therefore we believe that if these studies have been performed, their impact was likely to be limited.

Mainly practical reasons, and not profound scientific arguments, were the most important factor in changing the treatment of child bearing women. We do not suggest that more research is needed to study whether extended bed rest is more beneficial than early ambulation as nothing indicates that the former might be better. However, we believe that it is important to note that other factors than evidence based practice have played the major role in the past in shaping the best, currently used, practice.

Acknowledgement

We are in great dept to the (former) obstetricians and gynaecologists who helped us with this project. Prof. Dr H.J. Huisjes and Prof. Dr J.F. Schutte had time for personal interviews and were of great help. Prof. Dr P.E. Treffers and Prof. Dr J. Bennebroek-Gravenhorst also made time for discussions on this topic. We would like to thank J.W. Schoones for helping us with the literature search in the library. We thank Prof. Dr F.R. Rosendaal and Sir I. Chalmers for reading the manuscript carefully.

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