

## ACTIVE PHASE SLOW LABOUR MANAGEMENT: A REVIEW OF THE EVOLUTIONARY HISTORY OF THE 2 HOURS AND 4 HOURS OXYTOCIN AUGMENTATION TREATMENT

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### ABSTRACT

**Context:** Currently, slow labour is treated with oxytocin augmentation after delay of either 4 hours or 2 hours but there is debate as to whether the 2 hours or 4 hours delay is better to adopt especially for tertiary centre labour ward. Randomized controlled studies which have been conducted to resolve this issue have yielded conflicting reports because the studies used as primary outcome measures caesarean section rate or mode of delivery and perinatal outcome which are also affected by other confounding variables not related to the oxytocin augmentation. The debate as to which is better between the 4 hours and 2 hours delay before augmentation is still on.

**Objective:** In order to identify the appropriate primary outcome measure to assess the 4 hours and 2 hours delay before augmentation, a historical review has been undertaken of the evolution of the 4 hours and 2 hours delay in order to identify the aim of treatment of the slow labour progress in active phase. This is to reveal what dependable primary outcome measure that can be used to assess which of 4 hours or 2 hours can better prevent prolonged labour which is the original aim of treating the slow labour with oxytocin augmentation. This is the way to end the debate.

**Sources of materials used:** Information was obtained from Journals, medline, W.H.O. publications, Cochrane database systematic reviews and reputable textbooks using publications from 1969 to 2009.

**Materials:** In active management of labour, it is the aim to prevent prolonged labour through a strategy to identify slow labour progress and institute immediate oxytocin augmentation hence the need for hourly vagina examination in the original concept by O'Driscoll and associates. Because this regimen required a large compliment of persons with good obstetric knowledge and materials, implementation was difficult hence there were modifications. This was first by Phillipott who designed oxytocin augmentation after 4 hours delay and later 2 hours and 3 hours by other workers before oxytocin augmentation when slow labour occurred. In spite of these delay the results were comparable to what O'Driscoll obtained with immediate augmentation and hourly vagina examinations. Presently, oxytocin augmentation is often after 4 hours or 2 hours delay after slow labour occurs. In a bid to know the better option, between 4 hours and 2 hours of delay, there have been randomized controlled studies in which the primary outcome measures assessed, were caesarean section rate or mode of delivery and perinatal outcome with conflicting results. The conflicting report is because mode of delivery and perinatal outcome following treatment of slow labour with oxytocin augmentation, is dependent more on the cause of the slow labour and state of the fetoplacenta function before the augmentation. Hence, mode of delivery and perinatal outcome are not dependable outcome measures to assess which is the better option of 4 hours and 2 hours delay before augmentation. Since the aim of treating slow labour progress, is to restore progress to the normal 1cm per hours, cervical dilation rate, the appropriate outcome measure to assess in any comparative studies of the 4 hours and 2 hours are cervical dilation rate, duration of labour and reduction of prolonged labour rate.

**Conclusion:** It is concluded that the appropriate outcome measure to assess randomized comparative studies of 4 hours and 2 hours delay before oxytocin augmentation, is cervical dilation rate, duration of labour and reduction of prolonged labour rate. This will produce reproducible results and help identify whether 4 hours or 2 hours delay before augmentation contribute more to preventing prolonged labour.

### INTRODUCTION

Slow labour in active phase can be defined as a cervical os dilatation rate of less than 1cm per hour between at least two consecutive vagina examination (VE) performed by an experienced obstetric or midwifery staff to assess labour progress.. Such consecutive interval may range

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from 1 – 4hours although in current practice, the interval is commonly either 2 hours or 4 hours. The idea that slow labour progress should be identified and treated was first established by O'Driscoll et al, as a strategy to prevent prolonged labour instead of waiting for prolonged labour to occur before treating it. The studies of O'Driscoll identified slow labour progress as the earliest active phase labour anomaly to occur which if not treated will progress further to other first stage active phase problem like, prolonged labour, C.P.D. and obstructed labour. This is the principle of Active management of labour (1).

The current management of spontaneous labour is based on the assumption that an active phase labour course progress, which is at the cervical dilation rate of 1cm per hour, will end usually with vaginal delivery of a healthy baby to a contented mother in a majority of cases, where as, a progress of less than 1cm per hour (slow progress) is an anomaly which if neglected may result in abnormal outcome (2-4). This is why the practice of active management of labour entails amongst other procedures, regular hourly VE to determine the rate of cervical dilatation so that parturients, dilating at less than 1cm per hour can be picked up early in the active phase, and treated with oxytocin augmentation.(5). Slow labour progress may be caused by uterine inertia, C.P.D. or cervical dystocia. While slow labour progress caused by C.P.D. and cervical dystocia require immediate operative delivery, it is only slow labour that is caused by uterine inertia, that is medically treatable and responds very well to oxytocin augmentation. Provided the augmentation regimen is an effective one, slow labour progress especially when it is caused by uterine inertia, usually can be corrected back to Normal progress of cervical os dilatation at 1cm per hour or even more (6). However how easy the slow progress is corrected back to cervical dilation of at least 1cm per hour is dependent on how early the intervention to effect this correction is initiated. Controversies exist at the moment, as to which of the two interventions namely immediate and after a delay of 2-4hours may effect complete restoration to normal 1cm per hour cervical dilation rate which may usually be associated with vaginal delivery.

**(b) Evolutionary history of slow labour progress management**

**(I) O'Driscoll et al 1969**

O'Driscoll et al (1969) first enunciated the idea for immediate oxytocin augmentation as the best approach to correcting the slow progress fully back to normal 1cm per hour cervical dilation rate. He evolved a regimen called active management of labour (A.M.L.) which resulted in the achievement of an active phase labour duration of 12 hours for the delivery of a health baby to a contented mother at the time in obstetrics when duration of labour was often over 36 hours using this principle of immediate oxytocin augmentation. However, the practice of active management of labour in details, involved hourly VE, and instant oxytocin augmentation especially in primigravida for failure to dilate at the cervical dilation rate of 1cm per hour. This was associated with an augmentation rate of 55% from his published report in 1000 consecutive primigravida but vaginal delivery rate was over 90%, caesarian section (c/s) rate 5% and prolonged labour rate was under 1% (1-3; 7,8). The O'Driscoll regimen of AML to prevent prolonged labour rate reduced prolonged labour rate drastically and additionally had a bonus effect of low c/s rate and babies with good apgar scores at delivery. As a result of this outstanding outcome, AML was adopted worldwide as the standard obstetric care to prevent prolonged labour (8,9). However several studies outside Dublin, could not fully implement all the steps as outlined by O'Driscoll et al, particularly, instituting hourly VE, once active phase was confirmed and immediate oxytocin augmentation for slow progress and therefore had much poorer results than O'Driscoll (10-12). Some studies even raised the question of whether or not AML was the right solution to reducing prolonged labour rate and in particular, raised doubt about the issue of AML being associated with reduced c/s rate and improved perinatal outcome. (13-16).

**(ii) Phillpott and Castle: Origin of alert and action line with 4 hours separation.**

Phillpott and Castle '72 (17) like several others, could not fully implement AML by the O'Driscoll protocol because of lack of the appropriate obstetric staff. The bulk of the maternal care and delivering in the maternal care by Phillpott in Harare Zimbabwe were by midwifery and medical officers (without obstetric knowledge) mainly at the peripheral units from where most of the

complicated labour cases were referred to the central unit, often too late. This was so, because those who conducted the bulky of the delivery lacked the skill to recognize failure of active phase labour to progress at the normal rate of 1 cm per hour and early enough for the appropriate referral to the central unit. The only way at the time that was open to Phillipott and associate to reduce the incidence of prolonged and complicated labour and its sequelae was to incorporate the midwives and other medical officers who conduct deliveries in the peripheral unit in to a labour care programme that will easily make them recognize normal progress of 1 cm per hour cervical dilatation rate and any deviation from this standard progress.

In order to achieve this aim, he developed the Partogram for recording of all labour observations on the same format and incorporated the alert line as a visual mark of the normal active phase labour progress of 1 cm per hour cervical dilation rate. In practice, the plotting of cervical os dilatation on the Partogram which crossed the alert line was the visual signal to recognize labour progress of less than 1 cm per hour (slow progress) and hence the indication for referral to the central unit. Women, whose cervical os dilatation progress did not cross the alert line, had normal progress for which their labour and deliveries were supervised at the peripheral unit. Thus, by design, the alert line was an aid for the non-obstetric staff to recognize slow labour progress visually displayed as cervical os dilatation, crossing the alert line. Such cases were no longer to be managed at the peripheral Unit but referred to the central unit for management of this now obstetric anomaly.

The further management of this failure to dilate at the normal rate of 1 cm per hour (slow progress) at the central unit was often about 4 hours later' when they arrived from the peripheral unit. This was again incorporated on the partogram as an action line drawn 4 hours later but parallel and to the right of the alert line to visually signal the slow progress sustained for these 4 hours (18). It was only after these 4 hours that effective treatment began with procedure like oxytocin augmentation for poor uterine contractions or c/s delivery for C.P.D. or obstructed cases. The 4 hours delay before the effective treatment was inevitable because the skill for the intervention was not available until then, but also a signal for the

treatment to commence. The 4 hours was not based on findings from any study or even intended for any study but an aid for the obstetric staff to commence treatment for this now significantly delayed progress in a bid to prevent prolonged labour. Surprisingly, the outcome of this grossly delayed treatment after 4 hours showed good feto-maternal outcome with significant reduction of prolonged labour rate, and also even c/s rate, comparable to the outcome of AML by the O'Driscoll protocol. Hitherto, with the O'Driscoll protocol, a delay of treatment for slow progress of any duration, was feared would not prevent prolonged labour, and may even cause irreversible feto-maternal damage.

This action line system was the first attempt of any treatment for slow progress delayed for as long as 4 hours that was still associated with the prevention of prolonged labour and acceptable feto-maternal outcome. Thus, the Phillipott and Castle partogram with alert and action line became the novel approach for labour management to prevent prolonged labour in comparison with the O'Driscoll regimen of active management of labour. It was particularly suitable for several areas of the world where there were a shortage of obstetric staff. In such situation, the alert line aided the non-obstetric staff to recognize the limit of their care and the time to refer, while the action line aided the obstetric staff to recognize whence the slow progress must be treated without further delay. The outcome of the Partogram system was still good in spite of the delay before the treatment of the slow labour because it facilitated the management of labour course anomaly by the appropriately trained staff according to their skill due to the in built referral of slow labour to the obstetric team for the further treatment. Without such aid as alert and action lines system, non obstetric staff managing labour may not easily recognize such anomaly early enough for referral. This is why the World Health Organization (WHO) recommended the Partograph for labour care world wide in all settings of health care delivery. (19)

Following the WHO recommendation, the use of the Partogram for labour management spread rapidly world wide even to areas with abundant obstetric staff to manage labour and its complications without the delay of 4 hours. The efficacy of the Partogram was erroneously based on the treatment of the slow progress after the delay of 4 hours which seems to have been emphasized as the issue. It was then not realized that the efficacy of

the Partogram was due to the fact that the alert line was an aid to recognize slow labour primarily and through the inbuilt referral, ensure that the slow progress was treated by the appropriately trained staff with the skill to manage this obstetric anomaly. The extent of this misunderstanding is underlined by the fact that the Partograph with alert and action line separation of 4 hours was being used in several units even where there were sufficient obstetric staffs to manage the slow progress at the time of the occurrence without such 4 hours delay. The outcome of the Partogram system for labour management was good because the alert line facilitated easy recognition by non obstetric staff of slow labour that then referred and the subsequent treatment by obstetric staff of this slow progress as the way to prevent prolonged labour.

### **iii. John Studd labour stencils: Origin of 2 hours action line**

In spite of the good results from the use of the Phillpott Partograph the action line at 4 hours separation from the alert line after some period of use, was viewed as too long a delay in centres where the skill for the treatment of the slow progress was available without the need for transfer of the woman. John Studd et al led this criticism of the Partograph, and eventually devised the labour stencil curve as an aid for commencing the treatment for slow progress after two hours of delay instead of 4 hours, and foeto maternal outcome was better than the use of the Phillpott partogram in reducing prolonged labour rate but had a much higher oxytocin augmentation rate because of the much earlier intervention of 2 hours (20-21). This same result was reproduced by other workers (22). However, the labour stencil never gained wide spread use because of the high cost of the labour stencils especially for the developing countries.

### **iv. Individualized alert and action lines with 2 hours separation by Arulkumaran**

Eventually the concept of individualized alert and action line was developed by Arulkumaran '85 (23, 24) by which method an alert line was constructed from the admission cervical os dilatation in active phase on a slope of 1cm per hour on the cervicogram aspect of the composite Partograph followed by the consequential action line drawn 2

hours to the right and parallel to the alert line without the need for an external aid like the labour stencils. This highly simplified concept of slow progress treatment after a 2 hours delay led to the wide spread use of the 2 hours delayed concept for treating slow labour progress and results were just like for the use of the labour stencils (24).

### **v. Other slow labour progress treatment with 3 hour action line**

At this stage, the efficacy of the Partogram was erroneously based on the separation between the alert and action line (which reflect the delays before instituting the oxytocin augmentation to correct the slow progress). Thus, separation of the alert and action lines became the issue and adjudged to be the determinant of the good outcome in the use of the Partogram. It was forgotten that the good results of the Partogram was because the alert line usually signalled slow labour progress which by the inbuilt referral, ensured that the treatment of this labour anomaly was by the staff with the requisite skill and training and never by a non-obstetric staff who lacked such training and skill. Failure to realize the above, kept the belief that, the separation of the alert and action lines was the issue. Then, beyond the 4 hours by Phillpott and 2 hours by Studd and Arulkumaran, the idea of a 3 hours delay arose as the better option to improve Partograph success (25). Soon there arose a debate as to which had optimum foeto-maternal outcome between the 2 hours and 4 hours, and even later at 3 hours of delay before the treatment with oxytocin augmentation. Randomized controlled studies were conducted between 2 hours vs. 4 hours (26) between 2 hours vs. 3 hours (25) with conflicting results of 2 hours superiority (25) and 4 hours superiority (26) but in all these studies the main outcome measures were c/s rate and perinatal morbidity and mortality (27). Prolonged labour rate was not assessed as the primary outcome measure in these randomized studies even though the main aim of the oxytocin augmentation as a treatment for slow labour progress whether after, 2 hours; 3 hours or 4 hours is to prevent prolonged labour. Studies to assess the efficiency of the 2 hours; 3 hours or 4 hours oxytocin augmentation commonly assess c/s rate and perinatal outcome as the primary outcome measure with little or often no reference to the effect of the intervention at the 2 hours; 3 hours or

4hours on the duration of labour and prolong labour rate.

### **The debate and controversy**

#### **i. How should outcome of slow labour treatment be measured?**

In all practice situations, mode of delivery and perinatal outcome are subject to more confounding variable not related alone to intervention with oxytocin augmentation to correct slow labour progress. The mode of delivery as the assessed outcome of any intervention to correct labour course anomaly like slow progress is more a reflection of whether or not it was caused by uterine inertia, cervical dystocia or cephalo pelvic disproportion (C.P.D). When CPD or cervical dystocia is the exclusive cause of the slow progress, augmentation treatment whether at 2, 3hours or 4hours will end up with c/s as the mode of delivery but the duration of the labour will be shorter with the earlier intervention at 2hours or 3hours compared with the 4hours. The perinatal rate as the assessed outcome will depend on the state of the fetoplacenta function, before the intervention whether at 2, 3 or 4hours in which case, outcome will be best with the 2hours than either 3 or 4hrs. If on the other hand, the slow progress is caused by uterine inertia exclusively, the oxytocin augmentation treatment whether at 2, 3 or 4hours will end up with vaginal delivery provided there is good knowledge of oxytocin augmentation as an intervention for slow progress. The perinatal outcome when uterine inertia is the cause will also be dependent on the state of the fetoplacenta function before the intervention. The duration of the labour however, will be determined by when intervention was begun. This shows essentially, that mode of delivery and perinatal outcome as an outcome measure to assess the efficacy of slow labour treatment with oxytocin augmentation is determined more by the cause of the slow progress and prior state of the fetoplacenta function and not whether or not oxytocin augmentation was commenced after 2, 3, or 4hours of delay.

As explained, oxytocin augmentation to treat slow labour progress whether after 2, 3 or 4hours of delay will in the majority result in c/s as mode of delivery when the cause is due to either cervical dysocia or CPD. Whereas oxytocin augmentation at 2, 3 or 4hours of delay will predominately result in vaginal delivery when the cause of the slow progress is uterine inertia unless the augmentation process is

complicated with fetal distress during the course of labour. The actual aim of treating the slow labour progress with oxytocin augmentation to correct uterine inertia is to restore the cervical dilatation rate back to the normal 1cm per hour cervical dilation rate or more. Thus, the cervical dilatation rate after the oxytocin augmentation is the appropriate and dependable outcome measure to assess the efficacy of the augmentation treatment in restoring cervical dilatation rate back to 1cm per hour. In that consideration, the oxytocin augmentation began at 2hours will restore the cervical dilatation rate back to 1cm per hour faster than either 3hours or 4 hours delay which will be reflected in the duration of labour and reduction of prolonged labour rates in a comparative study. This point can be better understood by a review of the original aim of the alert and action lines on the partogram

#### **ii. What is the original purpose of alert and action lines on the Partogram**

The purpose of the alert and action lines is to prevent prolonged labour primarily by ensuring that labour course anomaly is recognized early by those who provide care in labour and refer to or call the attention of the appropriately trained staff and at the right time, such that the midwives effect delivery for progress not crossing alert lines which are the active phase labour cases not complicated with slow progress as long as progress remain to the left of the alert line. Obstetric team will effect delivery for progress crossing the alert and action line which are the active phase labour cases now complicated with slow labour progress of varying degrees. The alert line is the visual mark of cervical os dilatation rate of 1cm per hour in active phase and in practice, any cervical os dilatation plotted on the partograph which cross the alert line is a signal that slow labour progress has occurred. After this occurrence, only staff with the appropriate training according to the principle of the Partograph should manage the case further. The action line at 2hours, 3hours or 4hours is the time for intervention commonly with oxytocin augmentation after the slow labour has been signaled or recognized. Hence with the Partograph, the placing of the action line at 2hours, 3hours or 4hours is the representation of when to begin oxytocin augmentation after slow labour has occurred. Thus, the separation of the alert and action lines at 2hours, 3hours and 4hours represents in clinical practice, the commencement of intervention with oxytocin augmentation after

2hours, 3hours and 4hours delay especially in the Primigravida with the aim of correcting the slow labour progress back to 1cm per hour of cervical dilatation progress.

Therefore assessing labour with the Partograph in which the alert and action lines are 2 hours, 3hours or 4 hours apart, should measure cervical os dilatation rate, duration of active phase labour, and prevalence of prolonged labour rate as the primary outcome index to assess the intervention at 2, 3 hours or 4hours. When intervention ensures normal labour duration and reduces prolonged labour, the mode of delivery may usually be vagina and perinatal outcome greatly improved, and these can be assessed as the secondary outcome measures but not the primary outcome measure.

### **iii. What is the ideal primary outcome measure to assess oxytocin augmentation after 2 or 4hours delay**

When O'Driscoll et al (1-3) published the outcome of treatment of slow labour progress using the principle of AML the main outcome measure was the prevention of prolonged labour while the reduction of c/s rate and improved perinatal outcome were only as a bonus and secondary effect (2,3,7). Mode of delivery and perinatal rate is not only a function of intervention by the appropriate staff with the requisite skill, but also of the assessed cause of the slow labour which may not always be uterine inertia but also at times CPD and cervical dystocia that requires operative delivery. The debate in oxytocin augmentation treatment for slow labour should be, whether starting at 2hours or 4hours delay fully restore cervical os dilatation rate back to 1cm per hour as the primary outcome measure. Cervical os dilatation rate, following oxytocin augmentation is a more dependable primary outcome measure with reference to the prevention of prolonged labour as the aim of instituting the intervention. A study is presently ongoing at the department of Obstetrics and Gynaecology, University of Benin Teaching Hospital (UBTH), where oxytocin augmentation after 2hours compared to 4hours is being assessed on a randomized controlled trial design with cervical dilatation, rate, duration of labour and prolonged labour rate as the primary outcome measure and not mode of delivery and perinatal outcome. The hypothesis in this study is that oxytocin augmentation after 2hours delay only, compared to 4hours, will restore cervical dilatation

rate to 1cm per hour while mode of delivery and perinatal outcome may not be statistically significantly different between the 2hours and 4hours intervention since the management is at a tertiary level centre with abundance of skilled obstetric knowledge of varying degree. The use of mode of delivery and perinatal outcome as the outcome measure to assess outcome of oxytocin augmentation after delay of 2, 3 or 4hours is more subject to other confounding variables order than the oxytocin augmentation as an intervention to correct slow progress. When the outcome measure is primarily focused on post augmentation cervical dilatation rate, duration of labour and reduction of prolonged labour rate and not mode of delivery and perinatal outcome, the 2hours delay will better fulfill the aim of the augmentation better than either the 3hours or 4hours. Therefore, in order to end the debate as to which is more efficacious, between oxytocin augmentation regimen of 2, 3 or 4hours of delay, before oxytocin augmentation, the appropriate primary outcome measure to adopt for any randomized controlled trial should be cervical dilatation rate, duration of labour rate and reduction of prolonged labour rate.

### **CONCLUSION**

It is concluded that the appropriate outcome measure to assess randomized comparative studies of 4 hours and 2 hours delay before oxytocin augmentation, is cervical dilation rate, duration of labour and reduction of prolonged labour rate. This will produce reproducible results and help identify whether 4 hours or 2 hours delay before augmentation contribute more to preventing prolonged labour.

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