Frequently asked questions (FAQ'S): Phototherapy

Q1. **Can one use white tube lights for providing phototherapy?**

Cool daylight lamps (fluorescent tube lights 6 to 8, 20 W each) with a principal peak at 550 to 600 nm and a range of 380 to 700 nm are most commonly used phototherapy units in India. These units provide 10-14 $\mu w/cm^2/nm$ in the wavelength range of 425-475 nm, when the fluorescent tubes are new. With usage the irradiance is bound to be much lower than required for therapeutic purposes. These units are effective in the treatment of non-hemolytic jaundice in term and preterm neonates. Occasionally, these are not effective especially in cases of severe or rapidly increasing neonatal jaundice. Remember the tubes should be changed every 3 months or earlier if irradiance is being monitored. Putting a blue plastic perspex or glass sheet in front of light source will not increase irradiance of unit in blue-green range, but rather decrease it. These lights do not disturb the nursing staff and this is the only form of phototherapy in which safety has been established.

Q2. **Does blue light provide any additional benefit for lowering bilirubin levels?**

Because bilirubin is a yellow pigment, the bilirubin molecule is only capable of absorbing the photons of violet, blue, and some green. When broad-spectrum white light is used, only a fraction of the light affects the bilirubin. Blue light at approximately 450 nm is better absorbed than green light but green light (because of its longer wavelength) penetrates the skin better. The most effective lights for phototherapy are those with high-energy output near the maximum absorption peak of bilirubin (450 to 460 nm). Special blue lamps with a peak output at 425 to 475 nm are the most efficient for phototherapy and these do not emit harmful ultraviolet (UV) rays. Blue-green light may interfere with the monitoring of cyanosis. In addition, blue light causes nausea, giddiness and headache to the staff working in nursery. Green light causes erythema and s ubsequent tanning of skin. A combination of alternating four blue and two white tube lights (20 W each) are sufficient to provide adequate irradiance of 20-30 $\mu w/cm^2$ / nm in the wavelength range of 425-475 nm.

Q3. **What specifications of blue tube should be used for phototherapy?**

Use Philips 20 W, 2ft blue fluorescent tubes TL-52 for phototherapy units. These tube lights cost Rs. 700-900/- each. Don't use TL-02, TL-03, TL-05 Philips blue fluorescent tubes. These are cheaper (cost Rs. 250/- each) but produce harmful UV rays used for sterilization, attracting insects for killing or dermotherapy for

vitiligo. Imported 20W tubes for treatment of jaundice come with following specifications: F20T12/B – Regular blue; F20T12/BB- Special high output; 20SBW-NU – Blue white light; 20SBG – NU –Blue green light.

Q4. **What are the advantages and limitations of double surface phototherapy?**

By using double surface phototherapy more irradiance can be provided to a jaundiced baby which will result in faster decline of serum bilirubin. Unfortunately, the surface on which the baby has to lie is not comfortable for the baby in locally fabricated units available in India. A convenient way of providing double surface phototherapy is using conventional blue light and undersurface fibre-optic biliblanket phototherapy.

Q5. **How does Bili-timer work and help in monitoring of phototherapy?**

Bili-timer has an "electric eye" that turns the timer on only when the phototherapy light is on. Accumulated exposure time is continuously displayed during treatment, accurate to a tenth of an hour. It is battery operated and simple to use with any unit. Accurately recording exposure time is essential to evaluate treatment and maintaining medico-legal records.

Q6. **What are relative contraindications of using phototherapy?**

1. As an isolated therapy when exchange transfusion is indicated for removal of antibodies in the presence of rapidly rising bilirubin.
2. In presence of direct hyperbilirubinemia.
3. Porphyria
4. Concurrent therapy with tin proto-porphyrin

Q7. **Why does bronze baby syndrome occur?**

Bronze baby syndrome occurs when phototherapy is used in the presence of hepatic dysfunction and cholestasis leading to high serum porphyrins and copper. Bilirubin photo-products sensitize copper porphyrins to form brown photo-products that bronze the skin. Phototherapy with a direct bilirubin >2mg/dl indicating cholestasis may result in bronzing in susceptible infants.

Q8. **Is there a way to decrease the intensity of blue light experienced by personnel to offset adverse symptoms perceived by them?**

Yellow or amber-tinted transparent plastic curtain fastened as a skirt around phototherapy are found to decrease the symptoms of nursery staff. Alternatively, one of the blue lamps may be replaced with a gold or white fluorescent bulb. The light will compromise the efficacy to some extent.

Q9. **What precautions should one follow while using the phototherapy unit?**

1. Change tubes every 3 months or after 1200 hours of use or if the ends of the tubes are blackened.
2. Maximize bulb life by providing good air circulation to the phototherapy unit to prevent overheating of light bulbs because irradiance declines with rising temperature.
3. Maintain cleanliness and electrical safety.

Q10. **How can one increase the irradiance of phototherapy?**

1. By shortening the distance between infant and phototherapy unit. Make sure that temperature is being monitored if lights are very near to baby. Cold light sources can be lowered as close as 10-15 cms but always be cautious to measure temperature.
2. Add additional phototherapy units.
3. Line incubator with white cloth without blocking light. Use of white slings which reflect light towards baby or prevent the dispersion.
4. Change light bulbs every 3 months.
5. Use an additional fibreoptic bili-blanket pad underneath infant.

Q**11. What is intensive phototherapy?**

For hospitalized term and late preterm infants, AAP recommends "intensive phototherapy." This refers to an irradiance in the blue to blue-green spectrum (430-490 nm) of at least 30 $\mu W/cm^2/nm$ and delivered to as much of the infant's surface area as possible.

Q12. **What is the latest in phototherapy?**

A new high intensity gallium nitric blue light emitting diode (LED) phototherapy has been tested recently and found to be effective in lowering bilirubin by providing much higher irradiance for intensive phototherapy.

Q.13 **Which is better-continuous or intermittent phototherapy?**

Clinical studies have shown conflicting results about superiority of one over the other. Because all light exposure increases bilirubin excretion (compared with darkness), no plausible scientific rationale exists for using intermittent phototherapy. In clinical practice, however, phototherapy is never continuous. It is interrupted during feeding or brief periods of holding of baby by parents. While providing intensive phototherapy for critically high serum bilirubin interruptions should be either minimal or avoided.

Q.14 **When should phototherapy be stopped?**

Phototherapy may be discontinued in a term baby when the serum bilirubin level falls below 14 to 15 mg/dl. (if the phototherapy is commenced for bilirubin > 15 mg/dl) or the bilirubin level is below phototherapy line on the jaundice graph. After discontinuation baby should be observed for another 24 hours for rebound, especially for hemolytic settings. Discharge from the hospital need not be delayed in order to observe for rebound especially in non-hemolytic jaundice. If phototherapy is initiated early and discontinued before the infant is 3 to 4 days old, follow up of baby may be necessary for assessment of jaundice.